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The Charter Gas Engine.

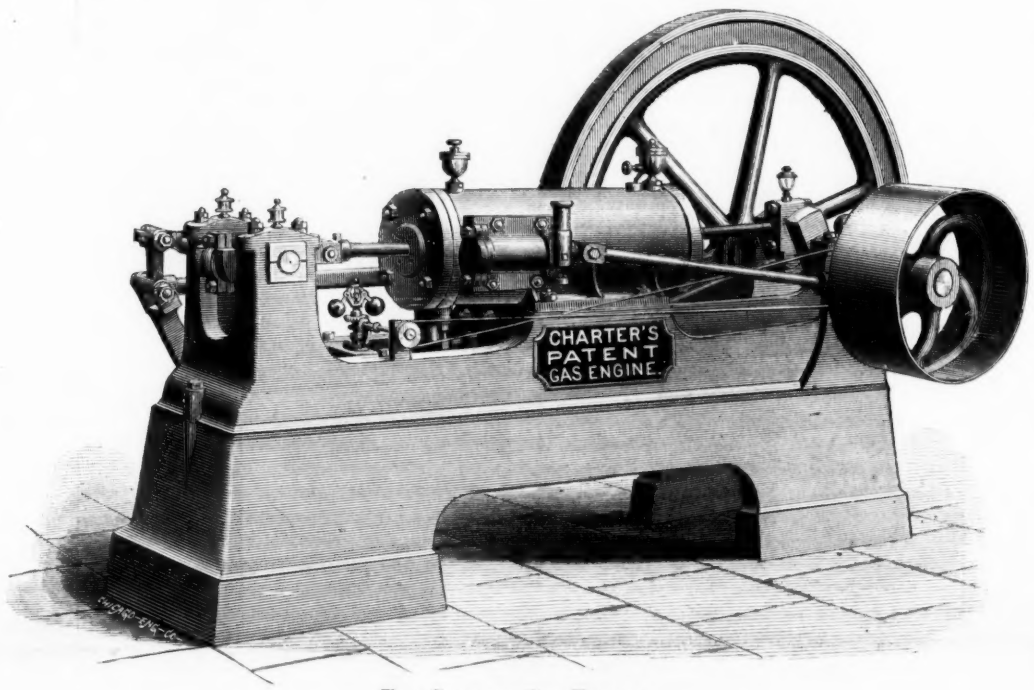
The favor and success that followed the introduction of the gas engine, and the constantly increasing demand for them, have stimulated inventors and engineers to make improvements in, and discover and add new principles to this source of power. Mr. John Charter, for the past eight years secretary and general manager of the Sterling Gas Company, also president of the Williams & Orton Manufacturing Company, general machinists of the same place, has made the subject of gas engines a study for some years, and has brought out the one herewith illustrated, which possesses some novel features that deserve the attention of those interested in the subject. This engine is provided with a power and a supply cylinder, the supply cylinder being placed under the power cylinder and inside of the base. These cylinders are provided with suitable pistons, which are connected by rods to one crank, this arrangement making the construction compact and simple. The power cylinder is somewhat longer than the supply cylinder, the extra length being at the back end, in which is seated a reciprocating disk or piston, called the transfer piston. This piston has only a short stroke, and its functions are: first, to act as a temporary wall or partition between the burnt gases and the new or incoming charge, and, second, to assist the power piston in expelling the burnt gases from the cylinder, and to prevent any fire or sparks from remaining.

The whole operation of drawing the explosive mixture into the supply cylinder, transferring it to the power cylinder compressing it, igniting it, and expelling the burnt gases, is as follows: The outward or forward movement of the power piston is caused by the explosion of a charge of gaseous mixture behind it. The piston of the supply cylinder being connected to the same crank is caused to move outward simultaneously with the power piston, drawing in gas and air for the next charge during its outward movement. When these pistons are at the limit of their outstroke, the transfer piston, which by a simple mechanical movement has been kept at rest at the limit of its outstroke during the outstroke of the power and supply pistons, begins its inward movement, meeting the power piston (which has begun its return stroke) at about the middle of the cylinder, near the exhaust port, which has been open during the inward movement of the power and transfer pistons. Thus the burnt gases are expelled, and the power cylinder is ready for a new charge. The exhaust port is now closed. A part of the charge previously drawn into the supply cylinder has been passing into the power cylinder through a suitable channel, and the balance is now being forced into the power cylinder behind the transfer piston by the further inward movement of the supply piston. The transfer piston being at the limit of its instroke now begins its outward movement, and the channel connecting both sides of the transfer piston with the explosion space in the power cylinder being now open, the charge is transferred to the explosion space.

During the above-described operation the charge has been compressed between the power piston and the transfer piston, the latter being again seated. This charge is fired by further inward movement of the ignition valve, which is very simple, being cylindrical in form, and requiring no springs or screws to hold it in position, thereby avoiding friction. This valve requires no adjustment before or after starting the engine.

The method of regulating the speed of this engine is simple and novel. Instead of cutting off the entire supply of gas when the speed becomes excessive, or the engine is doing less than full amount of work, the gas is drawn in the same proportion under al conditions, thus insuring a uniform mixture. The governor operates a valve in a large casing, and when the speed becomes too high the valve is not allowed to seat, and part of the charge is permitted to pass into this casing, from which it is drawn into the cylinder for the next charge, only sufficient being allowed to pass into power cylinder to furnish the power necessary for each revolution. Thus it will be seen that steadiness of motion is secured by giving the piston an impulse at every revolution, whether the engine is doing full or part work.

The amount of gas required to run this engine is said to be about 20 cubic feet per hour per indicated horse-power when working at full capacity. These engines are being manufactured by the Charter Gas Engine Company, of Sterling, Ill.



THE CHARTER GAS ENGINE.

Two-Cylinder Reversible Link Motion Engine.

The engraving represents an improved engine of this class, made by the Lidgerwood Manufacturing Company, 96 Liberty Street, New York. It is more particularly designed for use on dredging and excavating machines, and for operating machinery on, and propelling boats, scows or cars used in construction.

The bed-plate is of box form, level on the bottom, and provided with holes for fastening down, so situated that the foundation bolts are easily come at. The bed is of ample strength to keep its shape on an ordinary wood foundation, to which it can be easily and quickly fastened. It is open in front for convenience in connecting gearing in that direction as well as overhead, when desirable. In width the bed is compact, but not so narrow as to unduly crowd the parts, or render them inaccessible.

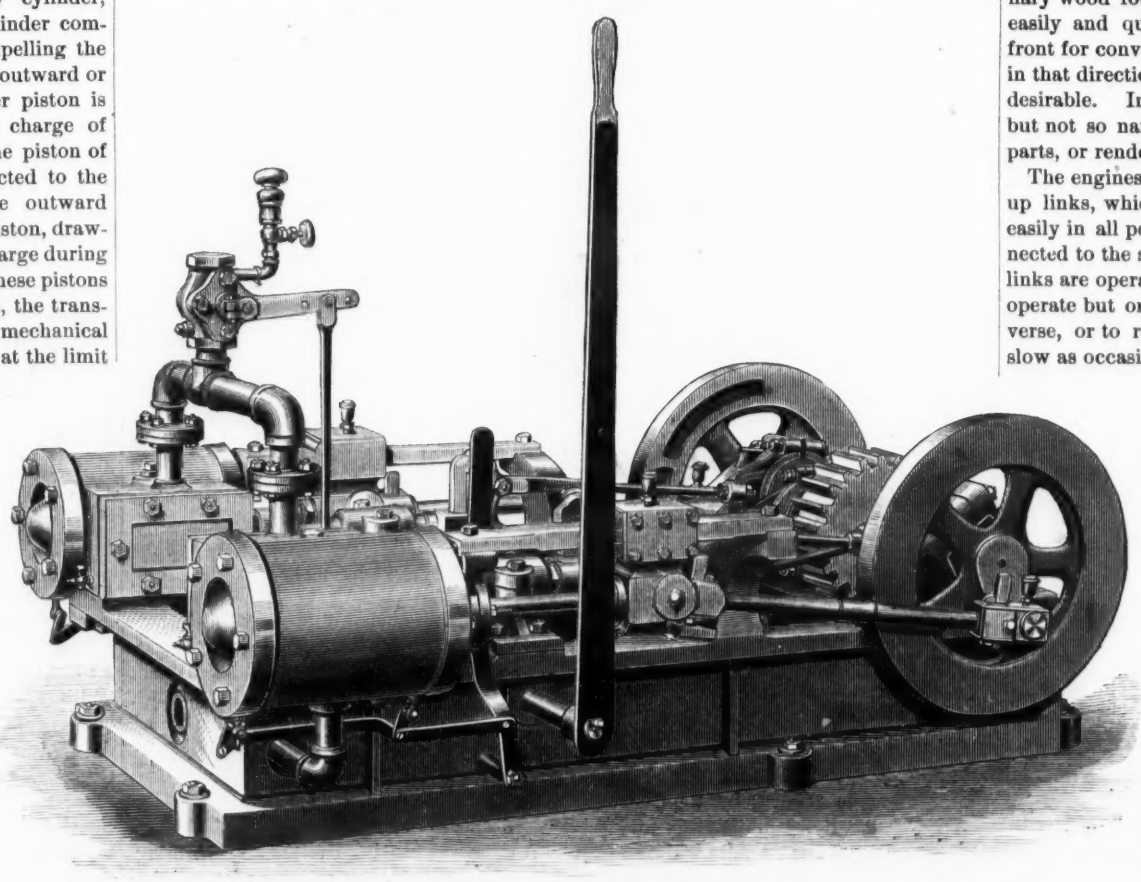
The engines are provided with well-fitted up links, which are balanced so as to work easily in all positions. The throttle is connected to the same movement by which the links are operated, so that it is necessary to operate but one lever to stop, start and reverse, or to run in either direction, fast or slow as occasion requires.

Piston-rods, valve stems, wrist, crank and link pins are of steel. The connecting rod boxes are of composition, and the cross-heads are provided with large composition gibs.

The crank-shaft journals are long, and the bearings are of approved anti-friction metal. The cranks are counterbalanced disks, and pains have been taken to insure smooth running at any reasonable speed.

The valves are the plain D slide, easily come at for inspection. The pistons are provided with self-adjusting packing rings.

In general design, such



TWO-CYLINDER REVERSIBLE LINK MOTION ENGINE.

parts as cross-heads, slides, valve motion, rods, links, etc., are of the kind used on small locomotives, proportioned and constructed for hard work and continuous usage.

Ample means are provided for thorough lubrication, and for taking up lost motion.

The cylinder cocks are all connected to one lever for opening and closing.

Altogether, the engine is well designed and constructed for the purpose, and should give good results in use, both as to economy in the use of steam, ease of handling, and little liability to get out of repair.

All parts are made to template, and are kept in stock so as to be duplicated without delay. Each engine is tested under steam at the works.

They are made in sizes from five to fifty horse-power.

The Bourdon Pressure Gauge Tube.

BY C. A. SMITH.

Recent discussions in your valuable paper reassure us that mechanics are interested in the study of difficult mechanical problems, and in attempting to solve them. Although the explanation of "Why curved tubes have a tendency to straighten when subjected to internal pressure," is not a very difficult task, there are a great many to whom it would be a difficult problem if they should attempt it—even some who *think* they understand it perfectly. I have had similar experiences. We may think we understand a certain question perfectly, but find ourselves puzzled, and sometimes defeated, when we are called upon to explain or prove it. The cause of this is that we do not understand the *principle* underlying the question with which we are wrestling. It is very important—yes, absolutely necessary to our highest success—that we should understand the *governing principle* of any phenomenon in order to apply it, in practice, to the best advantage.

The Bourdon Pressure Gauge tube is one of the problems concerning which we hear frequent and sometimes amusing theories advanced. An inventor, "once upon a time," related his experience with this stubborn tube to the writer. Being very desirous of applying the principle to an invention which he had in progress of development, he procured a suitable tube of *circular* cross section, bent it to the desired curve and finished it "in good shape." But, lo and behold! when the pressure was applied the obstinate tube would not yield in the slightest degree from its original form. The conclusion was that the "tube theory" was a fantastic delusion and not worthy of any further consideration. Such are usually the conclusions of superficial investigators. The *ego*, of course, is never in the wrong.

But I do not wish to discourage any one in trying to solve difficult problems. On the contrary, I would say, go on, brother, it is the best mental discipline you can have. There is nothing that will be of so much benefit to you as the discipline you get in studying and mastering the *hard* questions which often confront you in your daily business. Persevere until you are satisfied that you have mastered them. You cannot afford to let them pass unsolved.

"But what of the tube question?" you ask. Well, if you ask me whether it is not necessary to flatten a tube in order to make it straighten when subjected to pressure, I answer, that the tube should be flattened, is *one* of the necessary *conditions*, but it is not the *cause* of altering its curvature.

"Then if it is flattened, and pressure be applied internally, will it straighten?"

I can answer *yes*, or I can answer *no*, with the same truthfulness. I can make two tubes which shall agree with the conditions of this question, but the change in curvature of the one will be directly opposite to that of the other.

"If the tube is flattened, and external pressure is applied, then will it straighten?"

My answer is precisely the same as in the preceding question. The reader may think these statements strange and untrue, but if he will patiently follow me I will endeavor to make them plain.

The geometrical principle involved in the Bourdon pressure gauge tube is very simple, and may be represented thus:

In Fig. 1, let *G* be a bent bar with a T-head at each end, as shown. Suppose four rods attached to this bar with hinge-joints at *A*, *B*, *C*, *D*, *E* and *F*. Now, suppose that forces be applied at *C* and *F*, acting in opposite directions as shown by the arrows. It may not be necessary to explain further that the action of these forces will tend to straighten the bar *G*, for, suppose that the bar *G* does not change its form as the points *C* and *F* are forced to *I* and *H* respectively, then the length of the dotted line *A I B*, must be equal to the length of the rods *ACB*. Also *DHE=DE*. This is a geometrical impossibility, and as *A I B* is shorter than *A C B* the points *A* and *B* must be forced farther apart as the point *C* is moved to *I*. Likewise, since *D H E* is longer than *D F E* the points *D* and *E* must be drawn nearer together as the point *F* is moved to *H*. Now, as the points *A* and *B* are forced apart and the points *D* and *E* are drawn nearer together it is evident that the bar *G* must yield in the direction of becoming straightened.

Now, it is evident that the same result

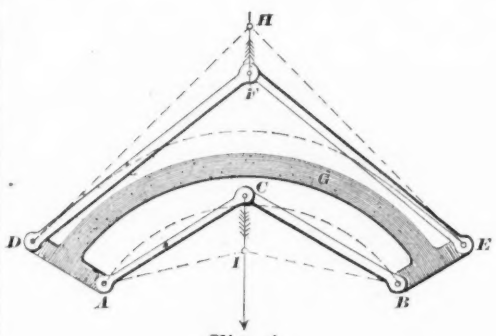


Fig. 1

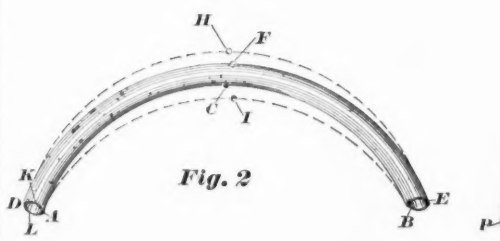


Fig. 2

would be obtained if circular arches (shown by the dotted arcs) were substituted for the rods and attached at the same points, *A*, *B*, *D* and *E*, and a load or force applied, uniformly distributed over their entire length.

It is further evident that if the direction of the forces be reversed the result will be reversed; that is, the bar *G* will become curved still more instead of being straightened.

Let us see what this has to do with the tube under discussion. Let *DACBEF*, Fig. 2, represent a tube of any form of cross section whatever. If by any manner or means we can force the sides of the tube—*ACB* and *DFE*—*outward* from its center line, as shown by the dotted lines *DHE* and *AIB*, we will have the same conditions supposed in connection with Fig. 1, the sides of the tube *ACB* and *DFE* corresponding to the supposed arches and the sides *L* and *K* taking the place of the bar *G*, and the tube will bend outwards or tend to become straight as explained. On the contrary, if we can force the sides, *ACB* and *DFE*, of the tube *toward* its center line it will become bent still more; in other words, it will *curve*.

We know that the distortion of any vessel, due to internal, or external pressure, will always take place at a point, or points, where it is least capable of resisting the pressure. For example, take a tube whose cross section is shown by the full line *LFKC*, Fig. 3. If we subject this to internal pressure the flattened sides will be forced outwards at *F* and *C*, since all the resistance the tube has to oppose the pressure at these points, is that of flexure. While the sides at *F* and *C* are forced *from* the center to *H* and *I*, the points *K* and *L* are drawn *towards* the center, and the tube will assume the form shown by the dotted line *PHQI*. As the pressure is increased the tube will continue to approach a circular form, where the limit of flexure is reached, and no further distortion takes place. This is, of course, supposing that the tube is made of a flexible material which is of uniform thickness. We see, then, that if we make the tube, Fig. 2, with an oval, or flattened cross section, as shown in Fig. 3, and form it as shown in Fig. 4, the sides *F* and *C* will be forced *from* its center to *H* and *I*, Fig. 2, when pressure is applied internally. This gives the conditions necessary to make the tube straighten, as we have seen.

The reader may have inferred ere this that it is always the two sides of the tube cutting the plane of its center line (at *F* and *C*, Fig. 4) which cause it to straighten, or curve. The sides outside of this plane (at *L* and *K* Fig. 4) have no tendency to lengthen, or shorten as pressure is applied, and hence have no influence in straightening or curving the tube except that they offer a slight resistance to flexure within themselves.

The reader may now understand the following conclusions:

I. *The tube will straighten:*

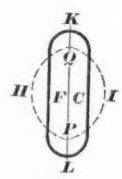


Fig. 3

Fig. 6

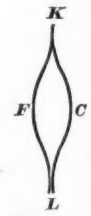


Fig. 7

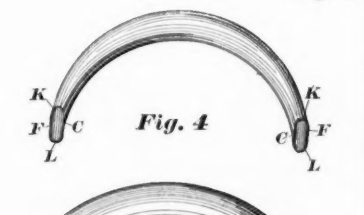


Fig. 4

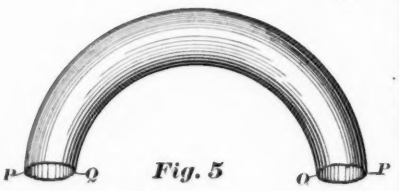


Fig. 5

(1.) When it is formed as shown in Fig. 4, and pressure is applied *internally;*

(2.) When its cross section is of an elliptical form, as *PHQI*, Fig. 3, and it is formed so its long diameter, *PQ*, shall lie in the plane of its center line,—as in Fig. 5—and pressure be applied *externally;*

(3.) When its cross section is of the form shown in Fig. 6, with its long diameter in the plane of its center line, and pressure is applied *internally.*

II. *The tube will curve:*

(1.) When it is formed as shown in Fig. 5, or *LFKC*, Fig. 3, with its long diameter in the plane of its center line and pressure is applied *internally;*

(2.) When it is formed, as shown in Fig. 4, or *PHQI*, Fig. 3, with its short diameter in the plane of its center line, and pressure is applied *externally;*

(3.) When its cross section is of the form *LFKC*, Fig. 3, and its long diameter lies in the plane of its center line, and pressure is applied *externally.*

These different forms will vary, of course, in sensitiveness of action; that shown in Fig. 4 being the most sensitive, as the sides *K*, *L*, are quite narrow and will therefore spring with less force than the other forms.

The most sensitive form attainable is that shown in Fig. 7, when formed with its short diameter, *FC*, in the plane of its center line, since all the resistance to flexure is here reduced to a minimum when the short diameter *FC* is made very small.

A company has been formed in Birmingham, England, for the purpose of providing the plant for supplying compressed air throughout the city to be used for operating machinery. The promoters of the scheme have examined all the methods in use for the transmission of power, and they have concluded that compressed air is likely to prove more economical than any other means. There is no intention to attempt supplying factories that can afford to run a steam engine with power; for, it is acknowledged that air compressed at central stations could not transmit power so cheaply as to compete with fairly economical steam plants, but there are many purposes where a small amount of power is needed, sometimes intermittently, and it is concluded that these will supply the company with customers.

A Track Maintenance Question.

A correspondent who is foreman of six miles of track on a railroad running north and south in Indiana, writes us asking an explanation regarding a case of track maintenance. He finds that the track wears more on the west than on the east side, and believing that no effect can be without a cause, he appeals to us to find out the cause of this phenomenon. We have seen this question discussed before in a somewhat pretentious way, and the explanation given was that unequal wear of track was due to the influence which the rotation of the earth has upon a moving train. We think, however, the cause is hardly so far-fetched.

If our Indiana trackman will note the prevailing winds, we think he will find that they are from the east during the period when the road-bed is softest and most susceptible to destructive agencies. The easterly wind pressing on the sides of trains pushes the cars heavily upon the western rail and so causes the extra wear noticed.

Scraps—No. 6.

BY J. G. TRAMIS.

In these dull times many people are trying to study out the cause; many others are trying to scheme some way to prevent the recurrence of such calamities in the future. Millions are trying to manage some way to get a living, and some few are trying to figure out means to relieve the present deplorable state of our business and industries.

Those who are ready to maintain the theory of "over-production" are likely to stop short of the end of their argument. There is too much and too many of many things. Not only too many manufactured goods and too much grain, but there are too many idle and too many hungry people. Too much money locked up in the trust and deposit vaults; too much money locked up in the United States Treasury; too much money locked up everywhere. The wheels have stopped moving, and it matters but little whether there are too many wheels or too few; when the wheels stop we have dull times.

We had the same thing in 1873, when there were but half as many wheels; we had the same thing in 1857, when there were but one-quarter as many. So long as the wheels stand still it will be dull times, and when they start times will be better. What can start them? Time and war. Time is slow and uncertain. War, while half the nation would be ready to go into it for some sentimental Monroe doctrine, is too terrible for any one but a Napoleon to indulge in for the simple purpose of improving the condition of the people.

Why cannot the same result that would be produced by war be achieved by peaceful means? What would be the result if the government were to call, as it did in 1861, for 300,000 men, arm them with spades and teams and wagons, in place of guns and cannons, and set them to straightening and narrowing the channel of the Mississippi? Our cities would be depopulated of their idle men; the farmer's spare hours provided for; the wagon and spade makers crowded; our textile factories busy making clothing; the treasury vaults relieved of the loads of bullion; the wheat from the western gran-

aries find its way to the laborers, and from their earnings to their families at home, and in six months all our industrial establishments would be as busy as ever. What else would do this? Anything that would give a paying employment to the laborers.

It is almost impossible to evade the idea that money paid for foolish things is wasted. The money paid for the Washington monument has gone from the Treasury, where it was not wanted—in fact, where it was doing no good—into the hands of the quarrymen and stonecutters, who needed it, and through their hands to others, so that thousands of debts have been paid and thousands of hearts made happy. In no way can government expenditures do as much good as to go into the hands of the working people, for indirectly through them they will help everybody, while the same money spent to increase the army and navy begins its course with the artisan.

Men will fight for glory with all its evils, but will not work for glory with all its blessings. Our people are ready to sacrifice hundreds of thousands of lives, and spend millions of dollars, to uphold an idea, but not the millions of dollars to save the thousands from starvation, and do a nobler work than has yet been done by man. Limiting the bounds of the Mississippi *may* be a task beyond the power of a nation, but if in the end the attempt was a failure, the money would not have been thrown away—certainly no nearer being thrown away than that spent in military and naval preparations, not to be used, but only to rust and rot away. The money spent to build and arm a navy would seem at once to improve our mechanical industries, but the money so made by our mechanics would have to go to support the the idle poor, whereas, if it went to the laboring poor first it would come to us in time.

The scheme of narrowing and straightening the Mississippi is a work of such gigantic magnitude, that were it not for the work already done by Captain Eads it might be believed impossible. It is, in fact, a work so great that the first few miles would exhaust our overloaded treasury; but a nation at peace, whose people are prosperous, cannot be bankrupt. The old adage, "prepare for war in times of peace," is fit only for the pages of a comic almanac. "The man who never carries a pistol seldom gets into a quarrel." The nation that has no army is quite as likely to receive, and much more ready to accept, an apology, than the one which has an army a little weaker than that of the enemy.

If war is barbarism, preparing for war falls how much short of being barbarous? If it is a nation's duty to care for and protect its citizens, should it spend its millions on the few who may be unjustly dealt with abroad, and who never have done nor can do much for the country in return, or should it spend its millions to aid the needy laborers who, if war should be forced upon us, would be the ones to face the enemy?

The *Northern Evening Express*, Newcastle-on-Tyne, England, publishes a letter on the tariff from a correspondent, in which he says: "Another very important feature to be remembered under our boasted Free Trade is that the very articles which we cannot produce ourselves have a heavy duty laid on them, whilst those which we can manufacture in our own country are admitted free. No less a sum than £13,000,000 is levied upon tea and tobacco; whilst luxuries, in the shape of silks, fans, toys, German and American clocks and watches, are admitted free. So that here the very spirit of Free Trade is violated, which is the interchange of commodities."

The Board of Trade of Cleveland, Ohio, is moving in the matter of the erection of a permanent exhibition building. Cleveland is fast attaining fame as an important manufacturing center, and the enterprise ought to be carried out without difficulty.

The Union Injector.

For this injector, the claim is made that the construction has been so simplified that any one not a skilled mechanic or engineer can, by the use of a monkey wrench and screw-driver, readily take it apart, clean and put it together again without danger of misplacing any of its parts. The combining tube, the jet of which is most likely to be deranged by lime coating, can be removed and replaced without disturbing any of the pipe connections whatever; while to remove all the jets, as will be seen by reference to Fig. 3, it is necessary to disturb but one pipe joint, and that in the steam pipe, thus preserving at all times the water joints intact; the manner of putting the jets back is such that it is impossible to get them otherwise than as they belong. This feature—ease of taking apart, cleaning and putting together again—will be appreciated where the water is impregnated with lime, or with matter that renders occasional cleaning of jets imperative.

Fig. 2 is a view in part section, showing all the parts of the injector numbered. These parts are made interchangeable, so that if it is necessary to order duplicate parts at any time it can be done from a card containing full directions, which accompanies each injector.

Fig. 1 shows the injector complete. It is operated with one handle. They are furnished either lifting or non-lifting, being made, we are imformed, to lift water twenty-five feet.

James Jenks & Co., Detroit, Mich., are the manufacturers.

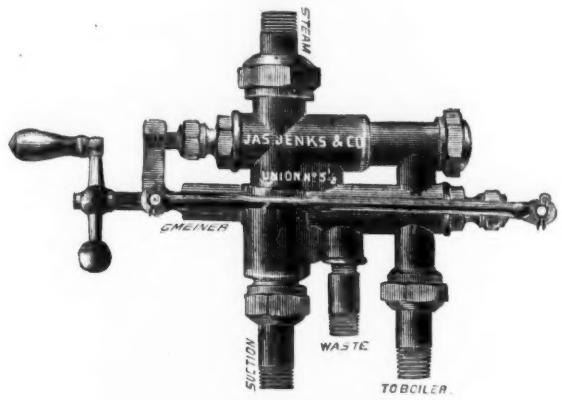


FIG. 1.

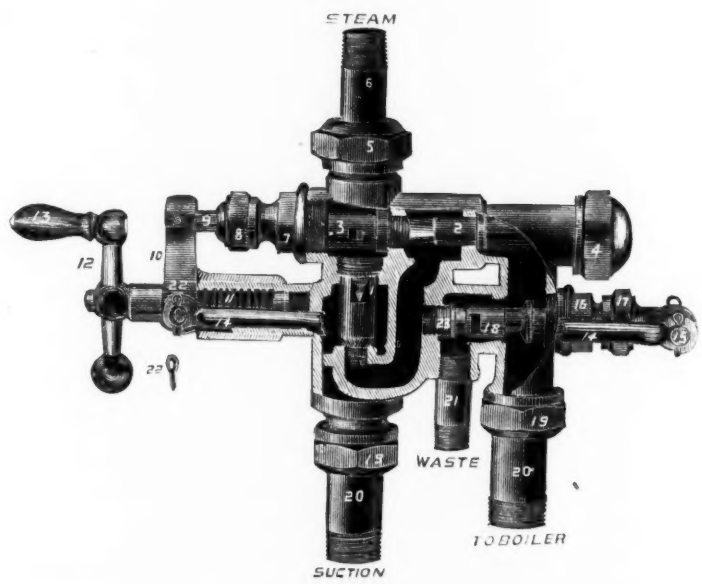


FIG. 2.

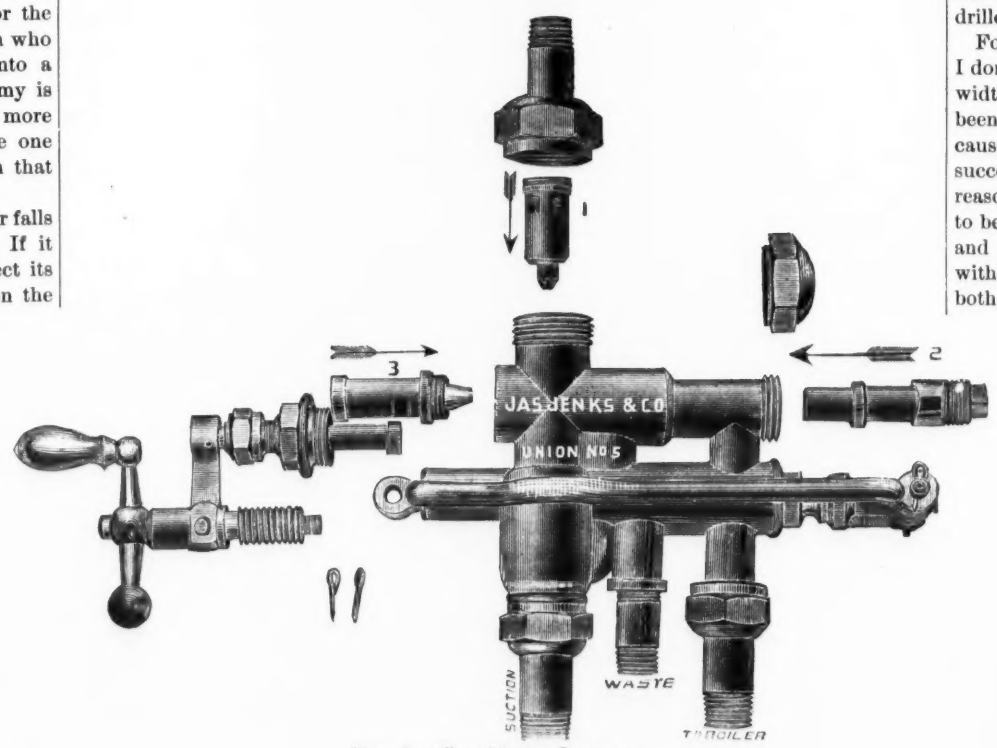


FIG. 3.—THE UNION INJECTOR.

A correspondent writing us from Colon, U. S. C., says: "Wages per day are as follows here: Engineers, $4.75; machinists, boiler makers and blacksmiths, $4 to $4.50; carpenters, $4. All overtime is 1½ hours for 1 hour worked. Board is $1 a day, payable in gold. Wages on the railroad are paid in American gold, which commands a premium of 30 per cent."

Hardening and Tempering Steel.

BY S. W. GOODYEAR.

In response to the call of Mr. Dicks I am puzzled to know how far I ought to, or may, in the brief space available in a newspaper article, "show my hand." While I am disposed to be accommodating, I see no real advantage which would grow out of my forwarding specimens of the cracked pieces, or of the successfully hardened pieces. The first would simply show a clean break through the piece at the point weakened by the hole, with the difference in appearance —"grain"—between the outer and hardened portion, and the inner unhardened portion, which usually results from hardening pieces of steel which are too thick to be hardened clear through, while the properly hardened unbroken pieces would show nothing but an unbroken hardened surface. As it would be next to impossible to break them in a straight line (as those which cracked in hardening are broken), a comparison of the fractures would prove nothing. It is evident that the hole in these caused the trouble. Filling the hole with clay did no good. Covering the hole with metal to exclude the water in quenching did no good. Position in which they were plunged in the water made no difference. I have seen the same difficulty with similar pieces of other sizes. I have known very ordinary steel, both imported and American, to both stand and fail under what was considered the best of treatment and in trying to insure uniform success by getting the *best* of each, still found myself no better off.

In the case of the pieces referred to, especially in the letter to which Mr. Dicks refers, the *ends only*, needed to be hard, these could not be too hard. The most convenient way was to harden all over; to be hard all over did the pieces no harm. There was no need of "modifying or tempering any portion for strength's sake," and practically no difference whether the hole or any other parts except the ends were "glassy hard" or not; but as they could not be hardened all over safely with the hole in, each end was thoroughly hardened, leaving the part in which the hole was required soft enough to be drilled afterward.

For my own part I am free to confess that I don't know why that extra quarter inch in width—everything else, as far as I have been able to learn, being equal—should have caused the wide difference marked by entire success against utter failure. I can think of reasons, but how can any of them be proved to be correct? The hole being of same size and depth in both cases, and constituting without doubt an element of weakness in both, the expansion of heating, followed by unequal contraction in quenching, breaking the wide pieces while the others remained sound, would point to a lack of the same proportionate weakening by the hole in both cases. My inquiries as to material brought the reply that both sizes were made from the same steel, *i. e.*, the same brand, but as the size—width—of bars from which they were made differed, how are we to know how much of actual difference there might be in the steel, owing to the difference in condition produced by the difference in work which one received from that received by the other, in coming down from ingot to bar in process of manufacture?

It is often the case that in hardening pieces of similar shape, but differing in size, which have been made from the same brand of steel, those of one size will give so much trouble by cracking in hardening as to call for a change in steel, while another will rarely, if ever, crack. To prevent cracking, springing, or changing in volume by hardening has called out thousands of infallible rules, as judged by the enthusiastic manner in which their respective authors and advocates tell us to do this, or that, and never have the least fear of failure; but who knows of a single one of these rules which has proved, even in limited practice, infallible?

I knew a case in which it was very important that a great number of pieces should be thoroughly hardened all over without change of shape, or at least so that all the change should be in one direction, the face remaining perfectly straight, as also the sides, in order that the line of direction of a groove difficult to make in the soft steel and the grinding out of which, after hardening, was considered impracticable should remain unchanged. Many experiments were made. Special arrangement of a stream of water under considerable pressure just beneath the surface of the water in the bosh was found a help, as by its use the heat could be conducted away from some parts faster than from other parts, and so through a series of trials and close observation the very intelligent and capable man who had the job in hand became able to control to a great extent and to locate at will, the inevitable protrusion growing out of hardening. The variation from original shape at the back of the piece could be corrected by grinding; to keep the face and sides from changing was the point. Was it accomplished? Well, not quite. They were pretty good, measured by ordinary practice. Some of them were marvelously near perfection, and still not a single piece came quite up to what would have been liked. "They'll do." But they heard of a "place where they had a man who had a way by which steel could be hardened and not change a *jot*." Just what they had been looking for. Several of the pieces were at once made up with unusual care and with gripsack loaded with them, the searcher after perfect truth in steel after hardening presented himself at the office of the "firm who had the man who could do it every time." To his queries came the reply, "Of course he can, no trouble about that." An hour later the "man who does it every time" proudly wipes off the first piece, examines it, and with the air of a man who *knows*, passes it to his expectant customer, who drops his straight edge first on the face and then on one side, and whose countenance drops as though an icy blanket had suddenly enveloped him. "What! you don't call this straight do you?" he asks. "I call it *pretty good*; I'd like to see *anybody* do *better*," is the reply. "But I want them *straight;* see here, and here; why a straight edge don't touch this anywhere!" "Oh!" comes the reply, "I did not suppose you expected to get them so that daylight would not show under a straight edge; nobody can do that." "But they are off a long way; we do them much better ourselves."

Why should they not do it better? With them it was a specialty for which suitable appliances had been provided. Is this not a fair illustration of the exact situation in many cases, where some would-be teacher finds that those whom he would teach can beat him on methods from the very start?

In hardening steel, so much depends upon the good judgment and careful observation of the operator, while the meaning of language used in laying down rules is so differently understood by different men, is it not better not to confine ourselves too rigidly to any rules as understood, but rather to be guided by the results in actual practice? If a bar of steel can be hardened so that while it is as hard as glass—temper undrawn—it shall have so great tenacity as to resist all attempts to break it with blows from a sledge, whereas a light tap with a hammer, or a fall to the floor, would have broken it if hardened in the ordinary way, *and it can*, would it not be a good thing to know how? Well, now don't expect me to tell you all about how to heat, and how hot, or what to quench in, or how. A little patience, a few experiments, will put you all right in these respects, if you will only make up your mind on the start that heating evenly, not too quickly, nor at the same time soaking too long in the fire, and quenching at just the right heat, with a certainty that at no time has the heat been greater during the process of heating for hardening, will put steel in its best possible condition, and further that the proof of proper heating and treatment in general is to be found in the condition of the steel itself, not in the "say so's" of anybody as to proper fuel, or heat, or what shall be used in which to quench.

"But," says somebody, "how are we to know the condition of the piece of steel after it is hardened?" My answer is: By hardening pieces of the same and by breaking them as a test of strength, and by that, and examination of the fracture, learning the heat which will give the sought-for result. There are usually scraps and ends of bars which can be used for this purpose, while in many cases it would be cheaper, where but one bar is to be used to do a certain job, to buy a second one with which to experiment, even if it was all used up in learning how it required to be treated.

But perhaps some reader will ask what this rambling letter has to do with the subject which was uppermost in my mind when I commenced to write. My object was to answer Mr. Dicks, and there is certainly meat enough in his short letter to furnish food for reflection leading to even longer letters than mine. "What steel * * * means and precautions * * * failures with *modus operandi* * * * homogeneous as possible throughout the piece * * *." Answers might be given to all these questions; but suppose any particular brand of steel should be named without reference to the temper of the particular steel used, when it is certain that all manufacturers of steel make, of necessity, a great variety of tempers to be used for different purposes, would any good grow out of the answer? It might, it is true—as there are some manufacturers whose steel is made with greater care and of better material than that of others—do good to advise the use of steel from the most reliable; but with the facts before us that there are so many good steels, both imported and American, our American manufacturers having for a long time past produced steel which has daily proven itself fully equal, for all uses, to the best which can be had from foreign sources, is it not best to answer, simply, *good steel?* For, no matter what steel might be recommended, the majority of steel workers would still stick to their favorite brands. As to "means and precautions," there are so many good methods in use by careful, thinking men, all of them productive of good results, although at times failing, that, were I a teacher, I would lay more stress upon the necessity of *gauging the heat right* than upon all other factors combined, for, were I to state how to heat, and with what fuel, and what should be used as a quenching mixture, is it not apparent that a host of men would rise up in opposition to any plan which I might advise because it did not harmonize with their beliefs and practices?

I knew a man who always used as a quenching mixture cold water containing a percentage of sulphuric acid (the exact proportion I have forgotten), and insisted upon the necessity for removing the cooling piece from the mixture before it was cold, and quickly placing it over the fire, or in the embers, warming up the outside—not sufficient to draw the temper, but enough to equalize the heat throughout the entire piece—and there was no danger of cracking anything in hardening. "Why, no! he never lost anything." He invited me to see him harden a die which he assured me had cost to make not less than $75. Of course, it paid to make some special provision and spend a little extra time, rather than to risk losing such a die; so the fire was thoroughly cleaned of all cinder, all bituminous coal was banished, the best charcoal fire that could be made did the heating; in a tub with a plug in its bottom was a *quantum sufficit* of the mixture *par excellence*. The tub was mounted enough above a partially-filled bosh containing the same mixture, to afford what was considered the necessary head under which the die was to be cooled off when heated. While the heating progressed, I was much interested in listening to recitals of such splendid successes by this method when all others had failed, and was shown pieces which had been hardened in this way, my attention being called to the entire absence of scale, the surface being of a uniform drab or light slate color, and had explained to me the reasons why pieces which were left in the cooling mixture till cold cracked; it was because when the outside had become cold, there was still a great deal of heat inside, and the unequal strain caused the piece to crack, while, if the piece was warmed up on the outside, the strain would be equalized, and a piece could not crack. Why, no. The die was heated well. Both pride and self-interest kept my teacher up to his best work. At just the very nick of time the simmering die came out of the bosh and went into the embers, and was hustled back and forth and turned over to even up the heat, and with a "There, you see," it was lifted from the fire. Just at this time we both heard something. That die had cracked in twenty places! Don't it seem a little strange that such a thing will happen just when we are showing up our good things? I hope nobody will blame the sulphuric acid, or the charcoal fire, or the primitive method for getting a head, or me as the Jonah whose very presence assured disaster. My friend made another die, just the same, from the same bar of steel, and hardened it successfully in the same way; and while I have not seen him harden a piece of steel in twenty years, I have no doubt he sticks to his favorite infallible (?) method.

But what other method has not had its failures? What plan could I, or anybody else, advise, that somebody would not say, "that's a fraud; have seen it fail?" When, however, you are told that unless a piece of steel of such size as can be hardened clear through is stronger and finer in grain—*much finer*—after than before hardening (and that the change is due to the hardening *per se*, not to how heated or what quenched in, or to any patent compound), the degree of heat to which it was heated was not right, and that by a very simple and interesting experiment, occupying but a few minutes of time and using but a few ounces of steel, you can have the most convincing evidence, don't say, "Pshaw! stuff! nonsense!" But just heat a piece of steel *too hot* (say about that "good, fair heat" which so many men want steel to stand or they won't use it) at the end, with the heat growing less as it reaches back further on the bar to a point where it will fail to harden, plunge it in cold water or anything you choose to use as a quenching bath, and drying it off, carry the extreme end a little over the corner of the anvil and break off a little piece, and then another, and another, noting carefully the force of blow required to break off each piece and the difference in fracture. Why the least little tap with the hammer will break off the first piece and the grain will be coarse, and as you go back on the bar to where the heat was less the force of blow required will be greater, and the grain finer, until just the right place is reached, and then the grain will be exceedingly fine, and the blow required to break the steel with the same depth of nick as a starting point will need to be heavier than to break it in its soft condition.

Hoping that some reader who has not tried this simple method of learning what can be done, and has not learned that steel is not necessarily made weak and brittle by hardening; that too much dependence is placed upon tempering as a means of overcoming the bad effects of overheating in hardening, will be induced to experiment with scraps and ends of bars, I will defer writing what I had intended at first until some time when this question of *how hot* don't keep uppermost in my mind.

In Haverhill (Mass.) 159 hatters went on a strike, and when it was found that the dispute could not be settled by arbitration they started a co-operative hat factory under the auspices of the Knights of Labor. It is expected that a co-operative daily paper will also be started in that city. The preliminary work has been entered upon, and in a few weeks its publication is to begin.

A recent English invention is for covering the tires of traction engine wheels with rope or other fibrous material, bound tightly in place.

LETTERS FROM PRACTICAL MEN.

Hardening Small Mandrels.

Editor American Machinist:

In your issue of January 17th, I note a communication from F. P., Boston, relative to the best method for hardening some small arbors (½″×14″), I would suggest to him an idea which will prevent springing to any great extent, viz., before dipping the rods take a stick and stir the water until it revolves quite rapidly, and plunge the rod into the center of the whirlpool thus formed, holding it steady until cold. From past experience I think he will be satisfied with the result. I think the idea originated some years ago at the Remington Gun Works.

I am very much indebted to you for the many valuable things to be found each week in your paper, and, if it were read by all machinists, the race of monkey-wrench artisans would soon be extinct. I wish you continued success in the good work.

FRANK H. TRACY.

Loose-Fitting Coupling Bolts.

Editor American Machinist:

I see in your issue of December 20, 1884, an item from "Old Jour" in relation to "fitting bolts to flange couplings;" will you kindly give me your views in the premises? We have had more or less argument in this matter from time to time before the item in your paper appeared. Our foreman in the shop has always said, from his own experience, shafting (for reasons given by "Old Jour,") would run better with bolts not a driving fit. He put up a line of shafting last fall with bolts a driving fit. It ran very bad. He took out the bolts, turned them just a shade smaller, put them back, and the shafting ran perfect. Would like some good authority on the subject.

CHARLES A. SCRUTOR.

[Flange couplings are generally found to be thrown slightly out of truth in keying to the shaft, and are trued up and the locking together completed after keying. Unless the halves of couplings are brought together and the bolt holes reamed through both together after being finally faced, there is danger that tightly-fitting bolts may tend to spring the shaft. Our experience has been that, with the couplings properly locked together to secure alignment of shafts, bolts fitted so they could be put in place without driving, were the most satisfactory. We have put up shafts as large as 6″ diameter, with the bolts loosely fitted, and never had any trouble with them.]

Car Transit on the Brooklyn Bridge.

Editor American Machinist:

I have read with much interest Mr. Mathesius' practical article on the above subject in your issue of January 3. It would seem from casual consideration that the car transit problem as presented by the New York and Brooklyn Bridge would be quite easy of satisfactory solution. We know not as yet what may be the outcome of electricity as applicable to this purpose. But according to present knowledge, it would be difficult, I think, to devise any arrangement better adapted to the purpose than an "endless cable system," if properly carried out in all its details. If the cable moves with a continuous speed of eight or ten miles an hour, it is important, of course, that the car should have a like speed at the instant it is coupled to the cable, in order to avoid all shock and wear and tear of cable and gripping device. The starting of a car load of passengers, weighing some ten tons, more or less, from a state of rest by a cable having a continuous speed of eight or ten miles an hour, is a "procedure which the laws of inertia and of inert matter will never permit without serious grumbling" (to put it in homely phraseology), whether the car is started suddenly or gradually. If the car is started gradually (as it must be, of course) there will be intense friction somewhere—which no gripping device can prevent—until the car attains an equal speed with the cable, and that friction will be destructive, of course, in proportion to the weight of the load started.

Hence light loads and moderate speed

should certainly be the rule until some arrangement shall be devised by which a car in motion may be firmly coupled to the cable, so that there shall be no possibility of slip either upon the cable or grip.

It would seem that the needed headway may be given to the car by a short incline at each end of the bridge, and that the cable might be raised to the range of the grip by the weight of the car acting on a suitably arranged lever at the foot of the incline, the grip to be set up to the cable by a man on the platform of the car. The distance between two of the cable carriers would be sufficient, probably, to raise and grip the cable with the car going at the speed of the cable.

F. G. WOODWARD.

How to Get Rid of the Fahrenheit Thermometer.

Editor American Machinist:

In your issue of 17th inst. you call attention to the absurdity of the Fahrenheit thermometer scale, and say: "If it could be at once abolished and the Centigrade scale substituted, we should be rid of an arbitrary nuisance which is already being banished from the domain of science, and is a real impediment to popular scientific advancement." I take it every one who has given intelligent attention to the subject will be prompt to endorse what you say. A very simple step, convenient to take and at once calculated to be productive of satisfactory results, lies within reach: If the signal service at Washington would make the substitution at all their offices throughout the country the popular mind would become thoroughly accustomed to the new system in less than six months, and men would wonder how they could endure the old so long. The change would involve a small additional appropriation for new instruments—or the conversion of old ones—but a small fraction of the surplus in the Treasury could hardly be put to better use. GEORGE MILLS.

St. Louis, Mo.

Overcoming Small Shop Difficulties.

Editor American Machinist:

Owing to the great demand for rapid workmen, it behooves the coming machinist to scrutinize the minutest details in all mechanical operations; in fact, substantial success depends upon this. The most careful and intelligent workmen are at times stranded, apparently, upon the most insignificant trifles. Every mechanical operation is attended with its peculiarities, and I think the exchange of ideas by machinists will help to prepare the shopman to overcome the small difficulties that often cause much trouble, and which, unless vanquished, detract from a machinist's value.

I saw a fellow the other day trying to drill a very small and deep hole in soft brass with a flat drill. Every attempt proved a failure. The drill would twist and break off. Every workman knows how disagreeable it is to have the head of the department standing by the machine waiting for the work, and you having to make a trip to the tool dresser every few minutes. You know that you are a good workman, but you are stuck. You expected to ask for a raise this week, but now, a little hole has upset the plan. You have got to the point where necessity is the mother of invention; you know that a twist drill is what you want, but the company don't. They want the holes, and you must get them done somehow. Having a genius of the detail sort, and watching causes and effects closely, you happily hit upon an idea which saves part of your reputation. The alleviator of this whole trouble was a drop of oil occasionally upon the drill. Oil upon the troubled waters, is for the machinist, oil upon the troubled metals.

Have not a great many of you tried a dozen times to take a finishing cut on a cast iron surface, a follower plate, for instance, and had the tool go a couple of inches, and then commence to drag and scrape when you know the tool is ground to perfection; yet something is wrong? What is it? If you will first take a comparatively smooth cut over it, so as to get it true, then pour a few drops of oil upon a piece of waste, and rub the surface so that all the pores in the iron are filled, then oil-stone your broad-nosed tool, and start a light cut, you will be agreeably surprised to find that the terribly poor tool steel, that you have been grumbling about for years, moves across great surfaces with a smoothness that fills you with a confidence that is healthful and easy on the nerves. On many roads they use piston and valve glands lined with babbitt. I was in one shop in particular where this is the case, and a set of them came to me to be bored out. I put my lathe on a high speed and started a heavy cut. I went out, and when I arrived at the scene of operation, the tool had gone half way through, and the machine had stopped. Upon investigating, I found that the shavings had wrapped around the tool, and formed a completely solid mass, perfectly welded in all directions, and I really had to get the babbitt melted in order to get the tool out. I felt quite mean when I afterwards found that by putting a little oil in the hole I could double the cut, and leave nothing to be desired in finish and trueness.

A grindstone out of order was always a source of great annoyance to me until I got into the habit of grinding my tools, cutting edge down, the reason being that with the edge down the bumps on the stone are leaving the edge, whilst when up, they are striking it.

In grinding tools for water finish on wrought iron, I find quite a knack; more than is generally supposed to be. A tool that will go over a long surface with a light cut, without riding or gouging, is something to be desired. There must be a uniform surface extending from the edge to the heel, perfect in every particular, corresponding with the contour of the grindstone. The idea of grinding the heel of a tool to get the blacksmith's color off, and then tipping the tool up and grinding the cutting edge won't do. Let the tool fit the circle of the grindstone, and set it as high above the center as possible, and I make a surface that needs nothing but a piece of chamois skin to make a nickel finish.

There are plenty of little ideas that give a vast momentum to the young mechanic, if those who have been through the mill would contribute them.

In tapping brass holes, that unearthly squeak is entirely avoided by the use of a drop or so of oil.

LEE C. SHARP.

ALBUQUERQUE, New Mexico.

A New Society of Mechanics.

Editor American Machinist:

As you have always shown so much interest in all things connected with mechanics, it occured to me that you would like to know of the formation of a new society in this city, called the Society of Mechanic Arts.

Its purposes are set forth in the constitution as follows: "To increase our knowledge of the mechanic arts and their associate subjects, and to better our judgment in the decision of every day questions relating to these. This is to be obtained principally by the reading of prepared papers, and by open discussion."

Regular meetings are held on the second Tuesday of every month. Each member is, in due turn, to present a paper on a subject chosen by himself, and announced one month before the reading of the paper.

The President is H. W. Wyman; Vice-President, H. C. Hastings; Secretary, E. H. Park.

Our numbers are few, and it is intended to keep the membership confined to a convenient number for advantageous work.

All of the members are actively engaged in some department of mechanical work, and all are young men of advanced ideas. There are among us partners in business, foremen, superintendents, draughtsmen, and the like. We expect much profit, and should be glad of any advice which you, with your experience, may wish to give.

Worcester, Mass. E. H. Park.

Self-Adjusting Swing Check Valve.

In this valve a straight and unobstructed water way is provided, as will be readily seen from an inspection of Fig. 1. The part upon which the seat is formed projects inwardly, and over this the yoke, shown in Fig. 2, fits easily. To this yoke the valve casing or clapper is pivoted. This casing is adapted to receive a disk of the well-known Jenkins compressible packing, the characteristic of which is, that while firm enough to withstand any pressure required, and while not affected by steam, oil or gases, it possesses sufficient elasticity to yield and make a tight joint against a seat not perfectly true.

The yoke which carries the clapper is

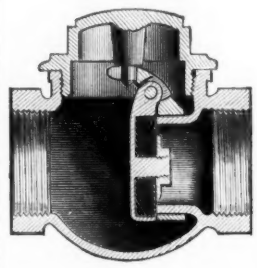


FIG. 1.

FIG. 2.

simply guided over the seat, and is free to move as the disk wears, thus providing for even seating and uniform wear of the disk, until completely worn out. When this occurs, which is said not to be until after several years' use, it is only necessary to unscrew the cap, remove the yoke and put in a new disk, the seat not being worn, the only wear being on the disk. Jenkins Brothers, 71 John Street, New York, are the manufacturers.

"Aciding" Files.

For the past two or three years there has been going on in New York and vicinity, and perhaps in other large places, a regular practice of buying old files—that is, files which have been worn out—and taking them to be, so to speak, rejuvenated. The process of doing this is to dip them in a very strong acid, which, while cleaning the file quite thoroughly, also eats away on the dull tooth to such an extent as to make it feel to the touch comparatively sharp. For serviceable work the file is practically useless; and we presume a number of our readers will be able to recall the time when a fair lot of files of a well known brand was offered to them at a ridiculously low figure, and which they bought, thinking they had purchased a mine of wealth, and a few days after would have given just about as much as they paid for the files for a chance to meet the man who sold the goods. We learn, on investigation, that the worn-out files in the shops of some of the large consumers are purchased by junk dealers, they paying $6\frac{1}{2}$ cents a pound for the old files, which is just $5\frac{3}{4}$ cents more a pound than steel manufacturers will allow for the same files to be used as scrap and again worked into steel. To some of the large consumers of files it has been a subject of comment that such prices should be paid for this scrap, but when we consider the point that the junk dealers get at least a cent a pound more for them, we can readily see where the profit comes in to the junk dealer. As regards the parties buying at that price, they treat them to an acid bath, with perhaps a current of electricity sent through the acid to give it double strength, thereby producing a file which, though very black in appearance, appears to have a good tooth, and if it can be sold to the ordinary machinist or consumer, the venture pays pretty well. The party selling the files thinks he has made a handsome profit, and the consumer thinks he has got a bargain. As a rule, he is never called upon a second time, as the seller of the files would hardly consider it safe.

The Kearney & Foot file has been so offered of late to various parties, and a year ago it became such a nuisance to that firm that they issued a circular offering $50 reward to anyone who would give them information enabling them to get hold of parties selling their files, treated in this way, as firsts. In some instances the parties had gone so far as to use the old boxes of that firm, thereby making the deception more perfect.

Boiler with Combustion Chamber in Middle.

In a recent letter, Mr. Stevens, general master mechanic of the Central Pacific Railroad, speaking of the locomotive boiler which we illustrated in our issue of December 13, says: "The engine which has the boiler with combustion chamber midway between fire-box and smoke-arch, and with large and small tubes, has been running now about two months. The boiler is working splendidly, and greatly exceeds our expectations. The engine is making 33 miles to the ton of what we call Carbon Hill coal. This coal is very fine; three-fourths of it would pass through a half-inch screen. This is better mileage by ten miles to the ton than the engine made with her old boiler. No changes whatever were made in the engine other than in the boiler. In a late number of your paper I notice an article by some one—I do not now remember who—stating that there was nothing new in this boiler. I did not claim that there was, further than in the different sizes of the tubes. I do not think that that had ever been tried before. I was well aware that a locomotive boiler with a combustion chamber midway between the fire-box and smoke-arch had been used years before, for I built one myself in 1874; but the tubes leading to and from the combustion chamber were of the same size. The boiler did not work well, however."

The Continental Iron Works Company, whose works are located at Greenpoint, Brooklyn, N. Y., have been struggling for years to produce a boiler-welding machine. They have not yet been entirely successful, but they are still working out the mechanical feat involved. At present they are making a machine for welding boiler seams, which has been designed and patented by Mr. Geo. S. Strong, Philadelphia. A company has been formed to handle the Strong locomotive, which was illustrated in the AMERICAN MACHINIST, September 30, 1882, and the first engine will be built by the Continental Iron Works. The most radical change from established practice in this locomotive is that the use of stay bolts and crown bars for the fire-box is dispensed with by making use of a cylindrical corrugated fire box.

Curious Railroad Accident.

A correspondent in Newnan, Ga., writes: "Yesterday a very singular accident happened to the south bound express train from Atlanta. In rounding a curve about six miles from the city, the track and switch slipped four inches just as the engine had passed over on the main line; the tender turned half round, sliding down a side track; the express car, and one coach following, went on to a third track. How the train got on to these different tracks nobody was able to tell. It was traveling at the rate of twenty-five miles an hour. There is no doubt but that it would have been a disastrous affair had it not been for the automatic air brake, which, when the engine broke loose, put on the pressure and checked the train so nicely that the shock was scarcely felt by the passengers. But for this, the indications are that the whole train would have been badly wrecked. Fortunately, nobody was seriously injured, although the train was crowded with passengers. Scarcely six months ago, two miles from the scene of this accident, a very serious collision was avoided only through the efficiency of the air brake. As it was, the engines instead of passengers took all the bruises."

Objection has always been made in this country to steam power on surface tramroads, on the ground of danger from collisions. Accounts from roads operated in this way in England show them to be remarkably free from accidents of this kind.

Condition and Prospects of the Machinery Business.

LETTERS FROM LEADING MANUFACTURERS TO THE AMERICAN MACHINIST.

(Continued from last week.)

J. A. Fay & Company (Wood Working Machinery), Cincinnati, Ohio, write us:

Our business for 1884 has been sufficient during the first nine months of the year to keep the greater portion of our force at work ten hours per day.

During the last three months we have employed five-sixths of our force ten hours. We are still running this proportion of our men full time, and, judging by what we learn from other manufacturers, we believe we are more fortunate than the majority.

Our trade extends to all parts of the world, and this frequently gives us orders from countries where times are not as dull as they are in others.

During the past three months our representatives from all parts have reported a falling off in trade.

This has compelled us to reduce our force somewhat, and prices have declined to correspond with the reduction in raw material and labor. At the present time we find that a large proportion of our trade comes from old establi-hed manufacturing companies who desire to replace old tools or cheap machines by those of better quality containing the latest improvements. Many of our new wood working tools will produce from 33¼ to 100 per cent. more work than the old style tools. These new style machines, with automatic feeds and with new improvements, have enabled us to employ almost our entire force during the year ten hours per day. We believe this class of trade will continue. We do not anticipate a large demand from new undertakings, and if we can keep our establishment running full time during the year 1885 we shall be exceedingly fortunate.

The Morse Twist Drill and Machine Company, New Bedford, Mass., write us:

On the whole we feel well contented with the year's returns to us. We have added considerably to the machinery and appliances heretofore employed, and adopted some new methods in the perfecting of our tools, resulting very satisfactorily.

The amount of business for the year will fall short, somewhat, of previous years, yet we have been enabled to retain in employ the greater portion of our help. At present we are running five days of each week, with a small reduction in numbers employed. Competition with dealers and manufacturers of goods in our lines, coupled with the depressed times, has brought about greatly increased discounts and much reduced profits. Our shops now extend in length four hundred feet, are of three stories and of good width, with smith shop, annealing, tempering and stock rooms adjoining. We feel that with the new year business will generally improve, and trust that the extent of our works, and the improved means and appliances at hand, with care in manufacture, will enable us to meet the wishes of our customers.

Warner & Swasey (Machine Tools), Cleveland, Ohio, write us:

During the year just passed we have increased our facilities by the addition of several new tools, and have kept our full force employed on full time.

We have often worked up pretty close to our orders, but they have come in fast enough to prevent an undue accumulation of stock.

From present indications we have confidence that our business for the ensuing year will be very good.

Sebastian, May & Company (Machinists' Tools), Cincinnati, Ohio, write us:

Although we have been in business but a few months, yet the results have been very satisfactory, and we find that we are already obliged to increase our facilities, and to that end are adding a number of new machines in order that we may be enabled to supply the demand for our tools.

We will shortly introduce several new and improved tools, such as lathes, planers, and drill presses, as we believe there will be a very considerable demand for these during the coming year.

We believe that the new year will be a profitable one to manufacturers.

Hilles & Jones, (Boiler Makers' and Bridge Builders' Machinery), Wilmington, Del., write us:

Considering the general depression in business we have no cause to complain whatever. During the past year we were kept quite busy until October 1st. Since that time have had a sufficient number of orders to keep our old hands employed, with but little stock on hand. Our specialty being improved tools for boiler makers and iron bridge builders, we anticipate a fair business for 1885, judging from the inquiries we are having. We think prices will be from 10 to 15 per cent. less.

The Hartford Tool Company (Machinists' Small Tools), Hartford, Conn., write us:

Our business in small tools of our regular make has been very quiet during 1884. For the past three months we have had a great many inquiries from all parts of this country and England. At present we are running full time (which we have done through the year 1884), on special tools, etc.

Wages, as a whole, are lower than in 1883. We expect more business in 1885, of which we can write you more definitely in a few weeks.

The Knowlton Manufacturing Company (Power Hammers and Agricultural Implements), Rockford, Ill., write us:

The past year's business in Agricultural implements was considerably overdone. Large productions, decreased demand and conservative feeling of buyers, required increased expense to secure trade, and trade was too often secured at prices unremunerative. Change in prices of materials going into the productions of 1885 cannot make good the depreciated selling prices of 1884. Trade in special manufacturing tools has not been large, but there is a steady demand by the enterprising for the most improved machinery, through which to reduce the cost of shop production. The trade in our power hammer has been considerable.

The Seibert Cylinder Oil Cup Company, Boston, Mass., write us:

We report a very good trade for the past year, our business, especially in locomotive lubricators, having increased very largely, and we have made a long step in advance in the lubrication of locomotive cylinders and valves, having gotten out and introduced a lubricator embodying our "sight-feed" (the drop of oil passing up through water), and made upon a new principle. This cup shows the feed at night fully as well as in the daytime, and has proved very successful, having been adopted as standard by a number of railroads. Some improvements of minor importance have also been made in stationary lubricators. Although the Seibert Company have previously confined their business to lubricators for locomotives, marine and stationary engines, they have for some time controlled a number of patents for different devices for lubricating bearing surfaces of engines. Some of these they have improved, and with the beginning of the new year will offer them to the trade. Among them is the Wilkinson device for lubricating crank and crosshead pins, which, on electric light and other high-speed engines where continuous running is desirable, has become almost a necessity. They also have a "visible-feed bearing cup," which is neat and desirable.

The Massachusetts Charitable Mechanics' Association, at their fifteenth annual exhibition, held in November, awarded the Seibert Oil Cup Company very high honor, giving them one out of five gold medals awarded in the department of motors and appliances, being the only medal awarded for lubricators.

We hope for 1885, with our lubricators and the new devices, to do a largely increased business.

The Wright Machine Company (Cotton and Woolen Machinery and Steam Engine Governor), Worcester, Mass., write us:

Our regular business—cotton and woolen machinery—has been rather quiet, but we think the outlook a little more encouraging. The steam engine governor which we have recently introduced is proving a success, and we anticipate a good trade in them the coming year.

E. Gould & Eberhardt (Machinists' Tools), Newark, N. J., write us:

We have every reason to be encouraged at the outlook for the year 1885.

While we are not so much hurried with orders as we were a year and a-half ago, we have improved the opportunity of putting our plant and tools in better condition, adding new facilities, and in putting new and labor-saving appliances on the tools we are building for customers, thus giving them the benefit of these improvements in preference to making reduction in prices.

We have added many new customers to our list during the past twelve months, besides replacing many tools of our own build with larger and improved tools for old customers.

With our universal automatic gear cutter, and other new tools which we have brought out during the year, and with others still to follow, we expect to keep as near to the front rank as our merits entitle us to.

The Billings & Spencer Company (Drop Forgings and Drop-Forged Tools), Hartford, Conn., write us:

Our business in the early part of the year 1884 was fully as good as in 1883, but during the latter part of the year we have felt the general depression of business. It is too early in the year to give an intelligent opinion in regard to business for the ensuing year, but we think the indications are that we shall have a prosperous year.

T. C. Massey (Vises), Chicago, Ill., writes us:

The vise trade for the first nine months of 1884 was fairly satisfactory, but since then has decreased very much. I find the sentiment of manufacturers is "for good tools," and although at present they are buying but small quantities, they look out to get their money's worth.

The beginning of the new year, as far as time is concerned, has fulfilled the desires of many people and the general expression is more encouraging.

J. E. Lonergan & Company (Oilers and Lubricators and Machinists' Supplies), Philadelphia, Pa., write us:

Our business, notwithstanding the general dullness complained of by parties in many lines, has largely exceeded 1883 in our sales of the Lonergan patent oil cups and lubricators. We recently shipped an order of 1,800 oil cups to be applied to machinery running in the International Exposition at New Orleans.

The Westinghouse Machine Company (Steam Engines), Pittsburgh, Pa., write us:

Our trade from the first of the year up to the end of May showed a steady increase of volume, April and May being the largest months in our history. The effect of the bank failures in New York was instantaneous, and our trade fell off one-third to one-half, and so remained for four months. In October, however, a decided revival took place, and during that month we entered orders for seventy-five engines, with a brisk demand. Trade during November has also been exceedingly satisfactory, and the prospects are good for a fair amount of trade during the winter months.

There is no doubt as to the general depression in manufacturing interests as we find them, but a fair amount of enterprise, and the special nature of our engine, has seemed to give us rather more than our share of the going trade. We have been partially shut down for two months, building a new and enlarged foundry, erecting-shop and storeroom, but we started up on the first of December with a full force and a capacity of 100 engines per month, and trust to keep running without reducing force or time during the winter.

Volney W. Mason & Company (Friction Pulleys, Clutches and Hoists), Providence, R. I., write us:

Since Presidential election we have had many more orders, and our business outlook is better than it was a year ago this time.

We have exhibited at New Orleans a one-ton elevator hoisting machine, and samples of our latest improved friction pulleys and clutches, and expect to reach many new customers by this exhibition. We already have had considerable trade South and West, in Texas especially.

The Brainard Milling Machine Company, Hyde Park, Mass., write us:

General business has for several months been dull, but taking advantage of the comparative lull we have brought out several new milling machines, improved the regular styles, and perfected our automatic gear cutting machines, upon which we have now been at work for the past three or four years.

Have thus kept our force together, working full time, at a small reduction in wages.

We think any opinion as to business the coming year is but guesswork, though, as the manufacture of machine tools is greatly overdone, prospects in that line are not very brilliant.

W. P. Davis (Foundry and Machine Tool Works), North Bloomfield, N. Y., writes us:

In regard to trade and the present outlook, will say, we have made as many machines this season as in any previous year. Our new style drill and key seat machine are fast coming into favor, and we believe we have a trade as good as anyone in our line. We have to acknowledge one mistake we made which we think is apt to be the case with all machinery men—our machines were not what they should have been when we first started in business, but we have worked hard to find out what was needed and to improve our work and facilities, and with our present facilities we are turning out as good machines as are to be found in the market for the money. With the key seat machine it takes time to introduce them. We are just in receipt of a letter from Stockton, Cal. A foreman there writes us three other shops are going to put them in, in his town, very soon. They have been in to see them work, and are well pleased. We have now machines working in England, France, Scotland and New Zealand, and in every part of the United States and Canada.

We are now putting in a steel boiler of double the present capacity; also steam pipe for heating our works; also an elevator, and building on to both foundry and machine shop. When complete we will have double capacity in foundry, machine shop and blacksmith shop. We have had to make very much of an effort to sell our machines during the year 1884. Our prices are the same but still we are making them so much improved that they cost us as much to make as they did one year ago. We think from the best of our judgment trade is going to pick up and be fair in the spring, and with fair crops, etc., we look for a lively time in the fall. Collections are very slow. As soon as business picks up, so the laboring man can get plenty to do at fair prices, there will be plenty of money in circulation, in our opinion.

Holland & Thompson (Steam Heating Boilers, Sight Feed Lubricators and Valves), Troy, N. Y., write us:

During the past year we have placed in private and public buildings throughout the country some fifty of the Holland patent boilers (making a total of 170 now in use for the three years which they have been on the market), for warming private and public buildings, and from the success which they have met with we are convinced that they are as good a boiler as any, and far superior to many now in use.

Owing to the rapid increase in the sale of the Holland patent sight feed lubricator, we have been obliged to place in our factory several new machines of improved pattern, so as to enable us to meet the demands of the trade.

We have also patented during the past year several new specialties, which are meeting with great success, especially our double-seated, extra-heavy globe valves, which are made so heavy that it is impossible to strain the seats by expansion caused by screwing in the pipes. These valves, as well as our patent gate valves, have met with marked success wherever introduced, especially among mill owners and iron companies throughout the country, and owing to their excellence and durability we have succeeded in securing for the coming year the contract for valves, steam cocks, etc., from the Cambria Iron and Steel Company, of Johnstown, Pa. In fact our business has so prospered during the past year that we are contemplating moving our works to more commodious quarters on the outskirts of this city, still retaining our store at the present locality.

Gage Machine Works (Lathes and Special Tools), Waterford, N. Y., write us:

Our business for the past year has been good; much better than we had reason to expect a year ago. Have employed a full complement of men until about two months ago, and at times have been obliged to work extra hours to fill orders, and are now running full time with about eighty per cent. of our usual force. During the past year have added to our facilities, putting in new machinery, and also made extensive repairs to our water power, and are now prepared to fill orders for our specialties promptly. In addition to our regular work we are making for the inventor, Mr Henry A. Mann, Jr., of Ballston Spa, N. Y., a number of machines for making envelopes.

Lodge, Barker & Company (Machinists' Tools), Cincinnati, Ohio, write us:

The volume of business this year (1884) with us is 15 per cent. less than last year. We have added $8,000 worth of the most improved and modern tools and appliances that are to be had, which not only enables us to turn out work of the greatest accuracy, but at smaller cost than formerly.

In regard to our opinion of the prospects for 1885, we are puzzled what to say. We can only express a wish that trade will be much better than it has been for the past three or four months.

W. F. & John Barnes Company (Foot and Steam Power Machinery and Mechanics' Tools), Rockford, Ill., write us:

Our business during the past year has been about the same that it was in 1883, but we have made a greater effort to get it. We have kept our regular number of hands at work, and disposed of our products.

The Cummer Engine Company, Cleveland, Ohio, write us:

During the year 1884 we increased our facilities by the addition of a large boring machine, several other large and important tools, and a steam hammer; also by adding new buildings and making some large extensions to our original plant. In the face of all this, we were compelled to do a great deal of night work for several months in the fore part of the year, besides running a full force in day time, owing largely to the fact of our adding the Ballantine ice and refrigerating machine and Jonathan Mills' universal flour dresser to our products.

We have furnished, during the past year, a number of large and important engines to representative concerns in the different branches of trade throughout the country. The fact that our engine business is constantly and rapidly increasing in the most skeptical sections, as well as elsewhere, is proof positive of the stability and superior merits of the machine.

The amount of refrigerating work that has been offered to us during the year is far in excess of our expectations, so much that we have been obliged to confine ourselves to the manufacture of plants for refrigerating breweries and like purposes, and have had to decline all invitations to bid on ice-making machinery needed for the coming season.

The flour dresser is also meeting with excellent success, and although we have been introducing it solely through correspondence, we are selling a great many of them, and are receiving a number of repeated orders, and they are giving the best of satisfaction wherever put in.

Fay & Scott (Machinists' Tools), Dexter, Me., write us:

Our business was very good the first eight months of 1884, but it has been very dull for the past four months. We are looking for an improvement in the early spring (and notice a few more enquiries during the past two weeks), and we shall be prepared to meet it, as we have added greatly to our facilities during the past six months, having just built a new, light and commodious shop and foundry, run by water power, and have doubled our plant of tools. We are about ready to offer something new in the way of heavy planer centers, which we fully expect will meet with a ready sale when business does improve. We have also lately gone to making an improved gauge lathe that is adapted to general wood work.

D. Frisbie & Company (Friction Clutch Pulleys, Hoisting Engines and Elevators), Philadelphia, Pa., write us:

We have not much new to write about. Our elevator business for past year has been fair for the times, and is improving. Have sold several of our hoisting engines to good parties, and they speak well of them and are getting engines for work of all kinds. Have furnished several electric light plants with our friction pulley; sent to the Chicago post office large lot; also St. Louis sub-treasury electric light plant. Have reduced prices about 10 per cent, and expect to have a good business the coming year. We will be prepared to furnish our goods promptly.

The Deane Steam Pump Company, Holyoke, Mass., write us:

We do not know that we have anything in particular to report in regard to the business of the past year, except that its volume has been pretty fair, although it has not been possible to realize such prices as would yield reasonable profit. We are at present, and have been for the last three months, running more than full time, and with nearly our full force of men.

James Clark & Company (Water Tube Steam Safety Boilers), Baltimore, Md., write us:

We have every reason to rejoice, as our business for the past year has been a very prosperous one to us, and have been so busy that we have had no time to spare. During the past year we have fitted out a large number of steamers with new machinery and put in repair other steamers. They were all coasters or river steamboats, of course, as the shortsighted policy of our Government won't let us build an ocean steamship, but leaves it to our dear cousins across the water to do. We have had no occasion to reduce the compensation of our employes, and don't expect to do so the coming year. As prospects look bright for 1885, we have added to our plant some new machinery for the purpose of embarking more extensively into the manufacture of the water tube steam boilers for land and marine service. The success we have had in the manufacture of the water tube type of boiler for the last three years, under the Moore patents, and the general satisfaction they have given to steam users, together with the number of batteries of boilers we have altered over of other manufacture of water tube boilers into the Moore system in this vicinity, and are so well liked, leads us to believe that business for the year 1885 will be very prosperous. As we intend to make the marine our forte, under the Moore system, and his latest improvements in this line, we are conversant with the numerous failures that the English nation have had in this direction in their attempts to introduce the water tube boiler in ship service. The English mechanics recognized the fact that the limit of steam engine construction was reached, and that any further economy must be gained in the boiler. It is well acknowledged that it does not require any more fuel to maintain 150 lbs. of steam on a generator than 50 lbs., and by working the steam expansively, as in a compound engine, the economy in favor of the high pressure is recognized. But how are we going to get the boiler to stand the pressure with safety? We are ready to fill that want, and will guarantee, with a compound engine, to maintain 150 lbs. of steam, and supply it not over three per cent. moist, which is considered dry, and this without the aid of superheating apparatus, but by centrifugal device that throws off the entrained water from the steam and returns the water to the boiler proper.

We have also just completed a large dredge machine for the Baltimore Dredging Company, of this City, which will be put into service at once by the last named company to clear the channel of a neighboring port. We have embodied some new features in this machine, which gives excellent results, and we expect to close orders for a still larger one soon. Our plant is complete. We manufacture all parts of our specialties at our works, which are under our immediate supervision, so that we are able to guarantee satisfaction to those that favor us with orders.

William Lowe, Proprietor Bridgeport Boiler Works (Boilers, Feed-Water Heaters, and Improved Boiler Furnace Fronts and Furnaces), Bridgeport, Conn., writes us:

Business with us has been less this (1884) than last year, and prices lower than ever we knew pro rata to prices of stock and labor, caused, we believe, by the small demand and reckless competition, while wages keep about the same for skilled workmen; but unless there is more demand and better prices soon, there must be a sweeping reduction of wages. The outlook for 1885 is rather gloomy and doubtful, but we have been preparing to meet competition and low prices by introducing Lowe's new system of traveling transferring cranes, for handling and working boiler plates and other work. We have also introduced Lowe's improved boiler and furnace fronts, and furnaces, for the Lowe boilers (for which we are never without orders), and the improved furnace for horizontal tubular boilers, which takes control of the gases and compels them to pass through a fire-brick combustion-chamber adjoining the furnace, and while passing through this heating and mixing chamber they are supplied with hot air, both under and over the gases, the full width of the furnace, and pass through a fire-brick wall to the chamber beyond, under the boiler. The entire regulation of the air supply, both under and over the gases, is under the control of the attendant, who can burn any fuel, or mixture of fuels, and get the most result from them. With these good, reliable and very desirable improvements, we can offer the users the best boilers and attachments at the lowest prices, and thus expect to get fully our share of the coming year's work. In feed-water heaters we are getting orders from long-time users, and from new customers, and have lately issued (for gratuitous distribution), a general history of feed-water heaters, and illustrating the Lowe heater, and giving valuable and desirable information to the users on this subject, and we shall soon issue one on boilers. Our predictions for 1884, that we should have dull times and low prices, have been verified, and we fear worse

times for the first half of 1885, but hope we may be agreeably disappointed.

The Buckeye Engine Company, Salem, O., write us:

Our business of 1884 has been very good; surpassing business in 1883 by a good margin. We have been during this year (1884) and are now running full time with about 200 men. A large portion of the year—up to Nov. 1st—we ran 14 hours a day every other week, in order to fill our orders with promptness.

We have sold this year 115 engines, averaging each 100 horse-power whilst our business in '83 shows sales of 98 engines, averaging something over 100 horse-power, leaving the balance largely in favor of this year's business. Since November 1st orders have materially lessened in numbers. The present indications for business the next six months are not at all flattering.

Our products have been well distributed in the States and Territories, as well as several foreign shipments during the year, principally to the Republic of Mexico.

Reduction of our prices has been made corresponding with present prices of material.

Up to present date we have not made any reduction in the wages of our men. In the direction of improvements in our engine, in the way of new designs and new patterns, we have done more this year than in any previous year. A portion of the results of our labors can be seen by referring to your issue Vol. 8, No. 2 (Jan. 10, 1885), and an engine of this type is now running a line of shafting at the "World's Industrial Cotton Centennial Exposition," New Orleans, La.

The Stiles & Parker Press Company, (Presses, Dies, and Tools for Sheet Metals, Drop Hammers and Drop Forgings), Middletown, Conn., and 59 Duane Street, New York, write us:

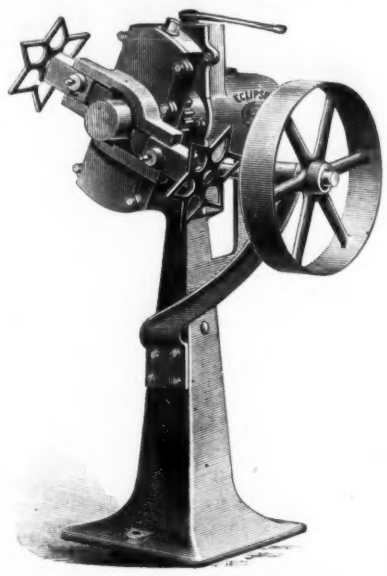
During the past year our volume of trade was as large as for the year 1883. We have made considerable reduction in prices. On the Stiles press the reduction is about 25 per cent. Last May business was pushing us beyond our capacity, and we were obliged to extend, either by erecting additional shops in Middletown or providing more facilities elsewhere. We leased the 5-story building corner Elm and Duane Streets, New York, and fitted it up with entire new tools. We are preparing to offer a new drawing press, in which the blank holder is operated by toggle joints instead of cams, which prevents the uneven pressure on the blank, a difficulty incidental to cams when they become a little worn. We have also made ready a new machinist's tool-grinder, to take the place of a grindstone.

Mr. Edmund Jordan, formerly with Bliss & Williams, has connected himself with this company, and is getting out new designs in machinery for working sheet metals and paper. Business has been quiet for the past few months, but indications are more favorable as we have received more inquiries since the opening of the new year.

John Lang & Sons, Manufacturers of Machinists' Tools, Johnstone, Scotland, write us: "We have pleasure in remitting you subscription for another year's copy of your interesting weekly. We consider it invaluable, for those who desire to keep pace with the rapid strides which are being made at present, in all branches of engineering and machine tool making in particular. We take every opportunity of showing it to our friends on this side, and have already secured a few subscribers, and trust we may induce many more to enjoy the benefits of a perusal. We find business very brisk at present with ourselves. We are finishing eight lathes for a new locomotive works, which is being started in Glasgow; also a 21″ center lathe weighing over 20 tons for shipment, besides a number of our stock lathes from 6″ to 12″ centers. We expect to erect in our works shortly one of Messrs. Thomas Shanks & Co.'s planing machines, 5 ft. square by 28 ft. long, and one of Messrs. E. Gould & Eberhardt's [Newark, N. J.] Universal Automatic Gear Cutters for wheels to 84″ dia.; besides other tools which will enable us to increase our output considerably in the year on which we are entering."

Reckless Coal Mining.

Job Atkins, mechanical engineer and mining expert, writes a communication for the *Mining Herald* respecting the terrible Pocahontas mine explosion, which seems to indicate that the disaster was not of so mysterious an origin as interested parties made it out to have been. He quotes several clauses from the mining rules in Britain, which are framed to prevent accidents, and shows that portions of these rules, considered of supreme importance in preventing explosions, were habitually violated at the Pocahontas mine prior to the explosion. Powder was kept loosely in kegs in the mine, miners without supervision fired blasts in solid coal without holing, and everything was conducted on a haphazard, helter-skelter system, regardless of life or property. After the explosion, had practical miners been on the ground, the men would have been taken out in less than forty hours. With a capable leader and



ECLIPSE CUTTING-OFF MACHINE.

prompt but cautious action, nearly half of the men would doubtless have been rescued alive. He defies any practical mining engineer, or any scientist, or any man living who will divest himself of all biased feeling and take into careful, conscientious consideration all the surroundings of the shameful recklessness before the explosion, and the unparalleled pusillanimity after the explosion to say that the disaster was anything short of the most cruel, inhuman, and atrocious wholesale massacre in the history of mining in this country.

The "Eclipse" Cutting-Off Machine.

This is a very simple and compact machine, powerfully geared, and will cut all sizes of iron, steel, tubes, or pipe from ½ inch to 4½ inches diameter.

The cutters can be repaired, or new ones made by an ordinary blacksmith.

It has two universal chucks, one for gripping and the other for centering the work.

It occupies but little floor space, and in its range embraces the sizes of stock ordinarily cut in a machine.

Pancoast & Maule, Philadelphia, Pa., are the manufacturers.

Garvin's No. 5 Milling Machine.

The engraving represents a new milling machine, made by E. E. Garvin & Company, New York. It is a double back geared machine, with cone on spindle, giving six even changes of speed, and three of feed.

The table is 48″ long by 12″ wide, and has three T slots its entire length; it is hollowed out at the end to catch the drip. The feed is 24″, with lever for quick return.

The knee has vertical adjustment of 18″, by a screw and bevel gear, operated by crank wrenches in front of machine.

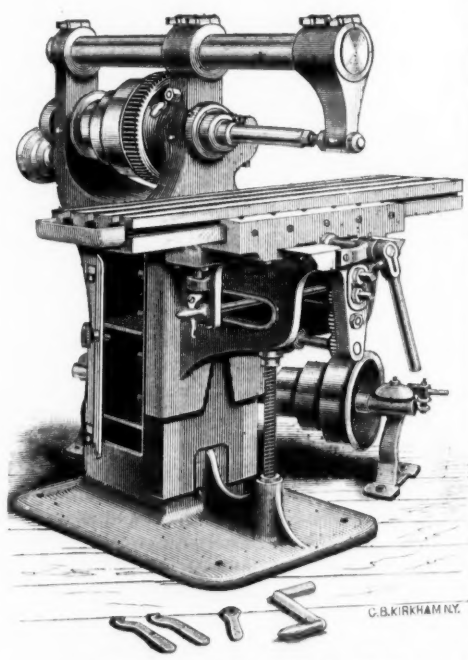
The spindle has front bearing, 3″ diameter by 5½″ in length. The hollow spindle is tapered in front to 1½″ diameter for arbor, which is drawn into place and held by a screw passing through the spindle to the rear, where it is squared for wrench.

The front box is so arranged that the top half, where the most wear comes, adjusts down to the bottom half that is not subject to wear, thereby keeping correct alignment.

The outboard center is supported by a 4″ cast-steel arm, adjustable for different lengths of arbors used.

The machine will take in a cutter 12″ diameter; weight 2,850 lbs.

The Great Eastern, the monster steamship, which in these days of large transatlantic steamers remains the largest vessel ever built, will be one of the attractions of the New Orleans Exhibition. She has been chartered to convey passengers from London to New Orleans, and if loaded full will take a big crowd. There have been rumors in engineering circles that this vessel was sold and was going to be used as a coal hulk at Gibraltar.



GARVIN'S NO. 5 MILLING MACHINE.

What Wood to Use for Patterns.

BY CHAUNCEY WING.

Of the first and perhaps greatest importance in selecting wood for patterns, is to secure that which is most sure to hold its form and place—which will not warp or shrink after being worked. It is very discouraging to the pattern-maker and unprofitable to the proprietor to find a pattern has changed its form or size by shrinkage of the wood used, when care and time have been spent to bring it to the highest degree of accuracy.

I believe selected and well-seasoned mahogany, or bay-wood, is more to be depended upon than any other. But this is too expensive to be generally used in large, bulky patterns, and most shops will only afford it for standard or delicate work. I would choose it rather than pine in thin work, where it is liable to split, and in patterns having sharp edges and corners, as the grain is not so free and straight. That best suited to patterns is quite soft and easy to work. But to go to the extreme in regard to nicking of corners and edges, and splitting of frail parts, a better choice can be made than to take mahogany.

For shelf brackets and other similar ornamental scroll-work, trimmings and fittings for children's carriages, etc., I have never tried any wood that answered the purpose so well as apple tree, but I would not dare to place it where there is dependence to be put on its holding its shape exactly after being worked to rule and straight-edge. It has a tendency to twist and warp while being worked, which I will not attempt to explain; cutting away some portions of the grain leaves an unequal strain on others, thus drawing it out of its original shape. I have received satisfaction in using this wood in patterns having slight or frail projections and thin places, as it is very tough and will stand a great deal of bending and twisting before it will split; it is also more likely to pass through the hands of the moulder and come out whole. There should be pains taken in making a glue joint, for if put together with surfaces, as ordinarily left by the plane, it will not amount to much. The surface should be well scratched with a scratch plane or other tool. It is also difficult to nail or brad, as it is almost sure to split, or the nail to bend, without a hole is carefully made with the brad-awl.

Another wood which makes a good substitute for mahogany and apple tree is cherry. In this, as is the case with mahogany, there is a wide difference in quality, and it should be well selected to get that which is suitable for patterns. What I consider best is that called here western cherry. It is lighter and of more free and straight grain, glues better, and is not so likely to warp as the native or eastern quality. A good quality of the western wood will not cost very much more than the best pine, whereas mahogany will cost three or four times as much. Patterns made of cherry stand wear and handling well, and are not so easily dented or battered by rough use and the thrust of the vent iron.

The varieties of wood already considered are practically adapted to only the most choice patterns. Ordinary work can be made of pine, and serve the purpose better, it being lighter to handle, and in large patterns this point should be considered, for the lighter the pattern the better it can be handled in drawing from the mould. As a rule, too, the lighter wood is best for patterns in other respects. It is pretty sure to keep its place better than the hard, pitchy kind. It is easier and quicker to work, and, if you wish to get the weight of your casting in a rough way by the rule of pound of iron to ounce of pattern, the lightest wood will come nearest to the mark.

In gluing pieces together, it is not a good practice to cross the grain at right angles for any purpose whatever. It will most surely defeat the purpose sought, and the pattern be a failure. It does not make much difference of how many ply the piece is made; the shrinkage in the wood, which will take place on being worked, cannot be avoided even in that which is considered thoroughly seasoned, and it will be enough to throw the pattern out of true or leave the end of one piece projecting beyond the other. I would hardly dare to put work together in this way, however urgent the case might seem to be, for I have often seen patterns come to grief from this cause. A better way to accomplish the purpose is to cross the grain at an angle of 45° or thereabouts, which will answer the requirements, and the chances for a successful job will be much better.

Cast-Iron Files.

At several industrial exhibitions, cast iron files have been exhibited that gave extraordinary results, and seemed to threaten to push steel files out of the market. The parties who control the patents for making cast-iron files, have, we understand, spent a great deal of money trying to produce a marketable article, but they have not yet made much progress. The great difficulty which they cannot overcome, is want of uniformity in the files turned out. A few in a batch may be perfect and capable of wearing out three steel files, but the others are worthless. If they could ensure the output of the cupola being as uniform as the contents of a Bessemer converter, their construction troubles would be ended. This they cannot do, and until it is accomplished, steel files will be cheaper than those made of cast-iron, because with the former there is no waste in manufacture. The process of making cast iron files is interesting. They are first cast in blanks, than annealed and cut by a process similar to that followed with steel files. After this they are ready for hardening. They are put into a wrought iron tube which is provided with the means of exhausting the air. This tube with its cargo of files is placed in a furnace, and the whole raised to a red heat. All air and vapor is then pumped out of the tube. Another vessel that is also put in the furnace, contains carbon in the form of bone ash or some similar substance. The heat evolves carbon gas. At the proper time the vessel containing the carbon is put in connection with the tube containing the files, and as the latter has been emptied of all air, the carbon gas rushes in to fill the vacuum. This gas gives the element of hardening to the cast-iron files. It is only after they pass through this ordeal, that it is known with certainty which files are good and which are bad.

Personal.

H. C. White, recently with the Westinghouse Machine Company, has accepted the position of manager of the New York office of B. W. Payne & Sons, for the sale of engines, boilers, and special machinery. A host of friends will wish him success. His office is room H, entrance 83 Liberty Street and 149 Broadway.

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☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen and all those especially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.*

NEW YORK, JANUARY 31, 1885.

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Importance of Steam Engineering.

We receive many commendatory communications from our readers which, however pleasing to us, modesty prevents making public. Occasionally—very rarely—a correspondent points out what appears to him to be an error of judgment on our part with reference to the general scope of our reading columns. As this is almost invariably prompted by the best intentions, we are always pleased with such expression of sentiments. Of these expressions the following kindly-worded protest—it would be better, perhaps, to say opinion—is a fair sample: "I like your paper very much, but think you have gone into steam engineering rather too much."

Steam engineering is one of the directions in which the AMERICAN MACHINIST has labored from its inception to the present time, but it was never our intention to give it undue prominence. If it appears to our correspondent that we do so, we believe it is because the subject is, and is likely to be, one of the most prominent connected with industrial progress everywhere; because mechanics, inventors, engineers, and the public generally, are, and apparently always will be, especially interested in it. And this being so it is natural that there should be more of interest in the way of progress and change to chronicle in steam engineering than in any other single direction of which the AMERICAN MACHINIST takes note.

Further than this, we believe it is the one branch of applied mechanics, some knowledge of which no mechanic or engineer can afford to be without. Although his present need of this knowledge may be small, there is always good reason to believe that the time will come when it will be of important service to him. How many mechanics in this age of steam are likely to go through life without somewhere on the road finding use for a knowledge of steam engineering? Very few, we think. On the other hand, how many have, unexpectedly perhaps, found this knowledge to have materially advanced their prospects?

Steam engineering is at the beginning of nearly every prominent engineering undertaking, and an important factor in a large majority of the industrial enterprises of the world. It has attracted a large number of the brightest and best mechanics and engineers of the day, whose aggressive enterprise gives the proper presentation of its progress a prominent place in any periodical that keeps abreast of mechanical and engineering advancement.

The AMERICAN MACHINIST, while constrained to give the attention to steam engineering that its prominent importance demands, is not forgetful of the other branches of mechanics that it aims to represent. When uncommon energy is expended in the direction of any one of these, we dare say some one will write to us with reference to it as our correspondent whom we have quoted writes with reference to steam engineering. In the meantime we advise all — especially our younger readers—whatever they may be engaged in at the present time, not to neglect to inform themselves, in a general way, at least, in steam engineering. It is a study that once begun is seldom abandoned.

More Train Wrecking.

A report comes from New Orleans of a fatal case of train-wrecking done on the North-Eastern road. To revenge themselves for the killing of stock, it was supposed that aggrieved parties spiked an obstruction on the track where there was a sharp curve. A passenger train came thundering along, and Robert Turner, the engineer, perceived the obstruction a few seconds before it was struck. He applied the air-brake, reversed the engine, applied steam, and remained at his post, doing all human energy could accomplish to reduce the violence of the crash that succeeded the engine's derailment at a most dangerous point. When the engine struck the obstruction, it was hurled over, burying the faithful engineer and fireman under the wreck, but the lives of the passengers were saved. Much indignation was expressed against the dastardly authors of this deliberate murder, that was planned by men who understood the fatal point to select for their operations. Detectives at once set to work on the case, and three men were arrested near Vicksburg, Miss., against whom strong evidence was obtained of being guilty of the crime. Lynching was spoken of as the proper method of punishment. It is scandalous that for a crime of this kind lynching should be considered necessary, but the regular course of law is so certain to fail in awarding proper punishment that there seems full excuse for people resorting to vigorous measures that are in themselves criminal. Train-wrecking is the most cowardly form of deliberate murder, and it is often done in a way that detection of the criminals is almost impossible, yet when cases occur where they are discovered the punishment is always so light that it has no deterring effect upon others. Train wrecking in the South and West is a far safer business to follow than horse stealing.

Fatigue of Metals Shown in Axles.

A case occurred some years ago on the New Jersey Central Railroad which seemed strongly to substantiate certain theories respecting the fatigue of metals. That company got six bob-tailed switching engines, which were put to work in a yard where a great deal of running was done over numerous frogs and switches, the service subjecting the running gear to continuous heavy shocks. They were all strongly built of the same pattern, and the axles were made unusually heavy. After these engines had been in service several years, one of them broke an axle. An inspection of the fracture showed that what was originally a fine, fibrous iron, had become coarsely crystalline, the molecular change, no doubt, having been induced by the constant jars. Within two months all the six engines broke axles, and the fracture in each case showed the same condition of the iron. The axles were all replaced with new ones, and the old ones were worked up into piston rods, straps, and other parts of locomotive machinery subject to severe and complex strains, and the material gave excellent service, the operation of re-working having restored its original strength.

Repairing Steam Engines.

The money spent in repairing a steam engine is often looked upon as thrown away, unless it is reasonably certain that it cannot be kept going without repairs. Often a judicious expenditure in this direction is an excellent investment, notwithstanding dissolution would not be imminent if repairs were not made. A slow speed engine (slow with reference to revolutions) may often be run in a condition to increase the loss from friction at least fifty per cent. without any alarming tendency to heat, or without being noisy beyond endurance, and the tendency is to let it run long after repairs are advisable on sound economic principles. It is of but little use to demonstrate that increased friction wears the parts out rapidly. That is one of the things too far in the future to have much influence. If it can be shown that repairs will have an immediate favorable effect on the coal pile, there is more hope of getting them done.

The following, from the experience of an engineer too modest to communicate it otherwise than verbally, although far from being an extreme case, illustrates the subject very fairly—perhaps better for being common. He was running a long stroke (16″×42″) engine doing about 40 horse-power of work for six hours of the ten, and about 80 horse-power for four hours, the power added being driving foundry blowers. From several years' use the crank-pin had got in bad shape, and the journals cut and out of round. Still the engine kept turning over, with only a little bother from getting warm once in a while—not warm enough to call for stopping the machinery. His arguments for repairs were not conclusive, and finally he agreed to demonstrate, after they were made, that the saving would be enough to pay the bill in a short time, and was allowed to go on with them.

To determine the saving in power he carefully indicated the engine before shutting down, all journals newly oiled, and all work off except the blowers. The engine indicated 44.7 horse-power. The repairs consisted in removing the crank shaft and truing up the journals, re-babbitting boxes, putting in new crank and wrist pins, new boxes for the crank pin end of rod, and some little general repairs. All these he calculated would account for themselves in the way of decreased friction. In addition to this the valves were seated, the saving from which his plan would not show. The total cost of repairs was a little less than 150 dollars.

After the repairs were made, and the engine had run about a week to get "smoothed up," it was indicated under precisely the same conditions as before; result 38.3 indicated horse-power, or a saving in friction of six and four-tenths horse-power. It was calculated that an allowance of 3 pounds of coal per indicated horse-power per hour was small, on which basis, predicating nothing for tight valves, the saving would pay the repair bill in just about one year.

An Unlucky Steamer.

Bad luck continues to follow the steamer "Daphne," by the launching of which so many lives were lost in the Clyde. In fact, as a Scottish contemporary says, if her keel had been laid on a Friday, if she had been launched on a Friday, if she had sailed on her maiden voyage on a Friday, and if she had all along been commanded by a captain of the name of Friday, greater ill-luck than has overtaken her could hardly have fallen to her lot. After being floated and put in order from her launching disaster, she was re-christened the "Rose," but had not been long on the Channel route till she met with a mishap in Portrush harbor. In swinging round she got foul of a ship's anchor which was down in the harbor, and the anchor going through her bottom she filled with water and sank at once. After considerable trouble she was floated and once more placed on the Irish Channel route. But ill-luck still dogged her passages, for in coming up the Firth one night she was stranded on the Big Cumbrae. After this disaster the steamer was sold as a wreck; but was floated, repaired, and re-christened by her new owner the "Ianthe." A few weeks since she left Glasgow for Smyrna with a cargo of coal, and while going down the Channel she struck on the North Rock off the County Down coast. After being examined it was found that she was making water, and accordingly the vessel's head was turned for Belfast Lough. She has arrived at Belfast. The cargo will require to be discharged, and the vessel will undergo repairs.

Saw-Mill Boiler Explodes.

No events can be looked for to happen with more regularity than the explosion of saw-mill boilers. That such events are deplorably common is no matter of surprise to those familiar with the kind of boilers generally used at the average rural saw-mill, and the character of the attendance upon them; but that the carnage arising from such boilers going suddenly to pieces is permitted to go on without legislatures trying to stop it, is discreditable to the whole country. Proper inspection reduces boiler accidents to nearly nothing, but proper inspection does not seem to extend to saw-mill boilers. The latest massacre by means of a rotten saw-mill boiler happened near Williamsport, Pa. The boiler of a saw-mill belonging to Daniel Boost exploded with fearful violence, instantly killing two persons and injuring six others so severely that several of them will die from the scalding. The force of the explosion may be judged from the fact that the men killed were thrown over one hundred feet from the mill. The boiler had not been

considered safe for some time, and some of the workmen were afraid that it would cause trouble. The owner of the mill says the explosion was caused by shortness of water. That is the explanation in some localities for all boiler explosions. If a crowd of owners of exploded boilers were sent to the penitentiary for killing men by criminal recklessness, there would be more done to keep boilers safe, and less necessity for framing excuses to avoid the responsibility for their destruction of life.

We publish about thirty more letters this week, from machinery and tool establishments, noting the condition of business and progress during the last year. In every case where the name of the establishment does not indicate the character of the business, we have noted in parenthesis the kind of articles manufactured. The conservative policy seems to have been generally observed and there is no disposition to push manufacturing so as to accumulate stock. When an improvement comes, machinery establishments are in position to take advantage of it.

The space devoted to these letters has caused several articles to be laid over. They will appear in future issues.

John B. Jervis.

It is now fifty-five years since railways began to be opened in this country, and most of the pioneers who took an active part in the promotion of these enterprises are long passed away. A few men who contributed by skill and energy to make the first railroads successful, yet remain among us, but they are fast passing away. If this country honored its heroes of industry as highly as it honors the leaders in war and politics, the whole nation would be dilating on the achievements of John B. Jervis, who died at his residence at Rome, New York, on January 12, in the ninetieth year of his age. As it is, the event is considered sufficiently recorded by a brief notice in the morning newspapers.

John B. Jervis was born on Long Island in 1795. During the early part of this century there was great activity in improving the means of intercommunication of the country by building roads and cutting canals. Mr. Jervis was brought up to the business of land surveying, and that work led him into a canal engineering corps. He was engaged in the construction of the Erie Canal, and when the Delaware and Hudson Canal Company was formed he was appointed chief engineer of the enterprise. Under his direction, a few miles of railroad intended for steam operating in connection with the canal were built, and this was the first railroad on which a locomotive was run in the United States. He appointed the venerable Horatio Allen to go to England and purchase rails and locomotives for this road, and a locomotive brought here on that order was the "Stourbridge Lion," which arrived in May, 1829, and whose boiler was shown at the Chicago Exhibition of Railway Appliances in 1883. Mr. Jervis a year or two later became chief engineer of the Mohawk & Hudson Railroad, and while holding that position designed the center-bearing engine truck for the locomotive, an improvement that was rapidly adopted by all American railroads, and in the course of a few years became a recognized feature of American locomotives. His inventive faculties were enlisted for several years in helping the railroad engineers to perfect the numerous mechanical details that made railroad operating safe and profitable. Throughout some sixty years of an active engineering life, John B. Jervis took a leading hand in the great enterprises of the country. He was chief engineer of the Croton Aqueduct, and he had charge of the building of several important western railroads. Since 1868 he lived at Rome, N. Y., in part retirement. He wrote a book on "Railway Property," another on "Labor and Capital," and lectures on "Industrial Economy," at the age of eighty-three. His mind was clear and vigorous until shortly before his death. He was conspicuous for his Christian character, his benevolence, and his strictly upright course in life.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(36) A. F. W., Providence, R. I., asks: What is a good lining metal for large boxes? *A.*—genuine babbitt metal. You will find the proportions in the AMERICAN MACHINIST of April 21, 1883. We refer you to Haswell's Engineers' and Mechanics' Pocket Book for plain rules for the loss of blowing off salt water.

(37) T. X., Quebec, P. Q., asks: What should be the size of the passage for the exhaust steam to the condenser in a compound engine the low-pressure cylinder of which is 36" diameter? *A.*—Make the exhaust pipe of such diameter that its area is about 50 per cent. greater than that of the port from which the steam is exhausted from the cylinder.

(38) A. C., Owen Sound, Ontario, asks: 1. What is the correct way for finding the nominal horse-power of a compound engine? *A.*—The nominal horse-power of an engine has come to have no particular meaning. It is said there are as many as six different ways of rating nominal horse-power in use by manufacturers in England alone. 2. How can I calculate the strength of a boiler stay at an angle with the head? *A.*—By studying the "Paralelogram of Forces," to be found in nearly every engineers' pocket-book, and notably clear in Trautwine's, you will readily see how to do this graphically.

(39) J. B., Elizabeth, N. J., asks: 1. Can the Corliss valve gear be constructed to cut-off later than half stroke? *A.*—No. It would be possible to make an arrangement to work in connection with the Corliss valve gear so as to bring about later cut-off, but it would then be some other valve gear. 2. Can it be constructed to bring about compression? *A.*—Yes. 3. Why can it not be used on high-speed engines? *A.*—One reason is that the piston will move too great a proportion of its stroke while the valve is closing; another, the difficulty of working the hooking and unhooking mechanism at high speed.

(40) J. L. H., Washington, asks: 1. If you place an ordinary freight locomotive on the extreme dead center on right side, and move the reverse lever from full forward to full backward gear, what distance will the valve travel? *A.*—It will travel a distance equal to the lead in center gear over the lead in full gear. 2. When a locomotive is moving forward, does the piston move forward and backward, or does the engine run away from it on the backward stroke? *A.*—The piston moves forward and backward, just the same as if the engine were jacked up and was running on blocks. In space the piston may be moving forward during its backward stroke, but in relation to its position on the engine it is moving backward. To say that the movement of a piston is not backward because the engine is carrying it forward, is just the same as saying that a train running east is not moving eastward because the revolution of the earth is carrying it westward.

(41) T. E., New York, writes: You will greatly oblige me by deciding the following argument: A claims that the first-class steamers crossing the Atlantic fill their boilers here, and in addition take a sufficient quantity of fresh water to last them for the trip across. B is adverse in his opinion, claiming that after leaving here with full boilers of fresh water they would replenish shortage with salt water. I am of the same opinion as B, with the following additional claims: that a steamer with first-class condensers, and doing nothing but running the engine, and no leakage, would cross the Atlantic with about a barrel additional of salt water. *A.*—If there were actually no leakage about engine condensers or boilers, the steamer would get across the ocean without any loss of water. This degree of tightness is, however, impracticable, and there is always considerable loss of water, which is replenished by sea water. In practice, it is found better for the boilers to use sufficient sea water to maintain a thin scale over the heating surface, as it prevents a violently corroding action that results from the use of condensed water alone.

(42) J. D, Danville, Ill., writes: 1. We have an air chamber 27 feet high, situated at the Y on the mains between two pumps. There is a 30" water glass 12 feet from bottom of air chamber. This glass is usually full of water (water pressure 115 lbs). In November one of the joints in the suction pipe leaked air, causing the pump to "kick" badly, when the water dropped entirely out of glass. Was this caused by the air which leaked in from the suction pipe finding its way into the air chamber? *A.*—From your description we should think this might be the cause. 2. Would mixing air with water, as noted, give the water a milky appearance? *A.*—With some kinds of water it would give it a foamy appearance that might be described as milky. 3. We have a heater or radiator for heating our room. Could we put a back-pressure valve in exhaust pipe and so get steam enough for the radiator without much loss from back pressure? The steam would have to be taken 14 feet above the floor after it had passed through a coil heater to heat the feed water. *A.*—You do not state size of engine. If a small engine, it would be satisfactory, but if a large engine, adding to the back pressure to save the small amount of heat required for a single radiator would probably cost more than to heat with live steam.

BUSINESS SPECIALS

Transient Advertisements, 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Katzenstein metallic packing, 169 Christopher st., N Y

Curtis pressure regulator and st'm trap. Jan. 10, p. 11.

Presses & Dies, Ferracute Mach. Co., Bridgeton, N. J.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John street, N. Y.

Herbert W. T. Jenner, Mechanical Engineer and Solicitor of Patents, 632 F st., Washington, D. C.

The Young Engineer's Own Book, $3. Edw. Meeks, Publisher, 1002 Walnut St, Phila., Pa.

For Sale—26" b. g drill presses, quick ret'n, bal. spindles, new, modern tools, $150. S. M. York, Clev'd, O.

Power Measured—F. Van Winkle, mechanical engineer, 22 Cortlandt street, New York.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

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Consulting Engineer and Mechanical expert, C. C. Hill, 84 Market street, Chicago, Ill.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Cooper, On the Use of Belting, $3.50. Edw. Meeks, Publisher, 1002 Walnut St., Phila., Pa.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

The "Wax Process" Engravings shown in the AMERICAN MACHINIST each week are made by Struthers, Servoss & Co., 32 Frankfort Street, N. Y.

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Farley's Reference Directory of the Machinists, Iron, Steel, and Metal-Working trades of the United States. A. C. Farley & Co., Philadelphia, Pa.

Improved Tack Machinery, made by The Willets Man'f'g Co., can be seen in operation at their works, 57 Clifford St., Providence, R. I.

The Complete Practical Machinist, $2.50; the Pattern Maker's Assistant, $2.50; Mechanical Drawing Self-taught, $4.00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

Locomotive Engine Running. By Angus Sinclair. Price, $2. A handsome, interesting book. Just the thing for a holiday gift. Published by John Wiley & Sons, 15 Astor Place, N. Y.

Brass workers' estimates wanted for making patented article of sheet, bar, and cast brass; weight, 9 lbs. Wm. Childs & Co., 114 Water St., N. Y. Canada patent for sale.

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Dixon's Plumbago Facing or Blackening. Competition is everywhere driving foundrymen to produce smoother castings. This can be well and cheaply done by the use of Dixon's Plumbago or black lead as a blackening or facing. Jos. Dixon Crucible Company, Jersey City, N. J.

Useful Information for Steam Users—A 100-page pamphlet, on the care and management of the steam engine and boiler, with hints and rules for engineers and firemen. Every engineer should have this book. Send 25c. in P. O. stamps to the J. N. Mills Publishing Company, 145 Broadway, N. Y.

MANUFACTURES.

Battle Creek, Mich., has secured the duplex Printing Press manufactory.

The Tyler cotton seed oil mill has been chartered, with capital of $50,000.

David Brawley, Charleston, W. Va., will probably establish a foundry in that town.

The Fort Smith Cotton Compress and Oil Company, Fort Smith, Ark., has added $37,000 to its capital stock.

A six-story brick factory is to be erected at 255 and 257 South Third Street, Philadelphia. The builder is E. Cubberly.

The Municipal Electric Light Company, Brooklyn, N. Y., will erect a brick factory 100x60 feet, on Penn Street near Broadway.

The Atherton Machine Company, of Tewksbury, Mass., has been formed, with a capital stock of $300,000. Abel T. Atherton, treasurer.

The Shipman Engine Manufacturing Company has been incorporated at Rochester, N. Y., with $12,000 capital, to make the Shipman oil engine.

A. M. Collins & Company, 527 Arch Street, Philadelphia, will erect a five-story card factory, 242x120 feet, corner of Ann and Oxford Streets.

Several new enterprises are on the tapis in Chattanooga, Tenn., including a $50,000 agricultural implement works and a $40,000 nail mill.

The boilermakers in East Saginaw, Mich., who went on a strike against a reduction of 25 cents a day, have resumed work at the old wages.

An iron foundry is being built at Fort Valley, Ga., and one is to be erected at Winchester, Ky. Another is probably to be erected at Columbus, Miss.

A committee of the citizens of Grand Haven, Mich., has been appointed to correspond with parties to secure the establishment of a tannery in that city.

Mayor Barnet, of Paterson, N. J., is building a new four-story brick mill, 150x100 feet, on the corner of Grand and Dale Avenues, to be let out with power.

Willingham & Company, of Columbus, Ga., will erect a 60x120-foot planing mill at Chattanooga, Tenn., to employ 100 men. It will be ready about April 1.

The Ogden Engine Company, Chicago, Ill., will be in the market with a new electric light engine by Feb. 1. They will add some new machinery to their plant.

The Chattanooga Saw Works, Chattanooga, Tenn., will build new works, 40x118 feet, being considerably larger than present factory. Will put in some machinery.

The Advance Threshing Machine Company, of Battle Creek, Mich., has increased its stock from $100,000 to $200,000, and will go into business on a larger scale than ever.

A company has been organized at Oxana, Ala., for the manufacture of steel. It is said that the stock has all been subscribed, and that the erection of large works will begin at once.

The Woodbury Engine Company, Rochester, N. Y., has been incorporated by J. E. Booth, H. H. Pryor and others, with $115,000, to build the Woodbury Booth & Pryor steam engine, also boilers and machinery.

The Nason Manufacturing Company, New York City and Brooklyn, has been incorporated for the manufacture of steam heating apparatus. Capital stock, $25,000. Carlton W. Nason, Franklin Darcoff and Samuel Gleason, trustees.

Jenkins Brothers, manufacturers of standard packing and valves, 71 John Street, New York, write us: "Our business for 1884 shows a decided increase over the previous year, notwithstanding the dullness of trade. The outlook for 1885 is encouraging.

The Watson Machine Company, of Paterson, N. J., has been organized for the purpose of conducting a general foundry and machine business; to build, manufacture, and repair machinery of all kinds, construct and repair bridges, etc. Capital stock, $150,000.

The Lidgerwood Manufacturing Company, 96 Liberty Street, N. Y., in addition to the orders for boilers and engines for the aqueduct noted in these columns last week, have received orders for six more double hoisting engines, also for sheaves and accompaniments, to be used in the construction of the aqueduct.

Among the recent large orders taken by the Egan Company, of Cincinnati, Ohio, was one for a complete outfit of improved wood-working machinery for the car shops of the Baltimore & Ohio Railway at Glenwood, Pa. This order comprises nearly all the machines used in the manufacture of fine passenger coaches.

Lodge, Barker & Company, of Cincinnati, Ohio, have recently supplied Mr. F. Lukenheimer, of the same place, with nine of their improved turret heads, which makes a Fox lathe practically into a Fox monitor. They are quite busy on orders for their new 24" shaper and improved valve miller, which mills with equal facility the smallest oil cup or a 3" valve, and can be used on swivel hose couplings and other irregular work. They are also busy on orders for their various specialties to the amount of several thousands of dollars.

Charles T. Stetson, Rockland, Mass., writes us: "I notice in your last issue that for want of business the factories of Rockland, Mass, are to be converted into tenement houses This might give a wrong impression as to the state of trade in the town. The case referred to is an old factory not well adapted to business, and is owned by parties living away from the town who cannot conveniently use the building for business purposes. Business in this town is about on a par with other towns; hardly up to years gone by, but a wide-awake commercial club are trying to induce any new business seeking a location to settle with us. A new tack factory has just been built, and is now running. A foundry is being talked up, and good facilities are offered in the town by way of room and power to let for fair rent. Very excellent schools are here. We of the town feel that we have a town worthy of consideration."

C. H. Beresford, mining superintendent of the reported millionaire, Miss Maude St. Pierre, is opening an extensive coal mine at Anderson, Tenn., and also a marble quarry. He reports that a bucket factory, a paint factory, a blast furnace, and a short railroad will also be built. Those who have had dealings with Miss St. Pierre claim that she is very prompt in her engagements, and able to carry them out.—*Baltimore Manufacturers' Record.*

There is talk among the lumbermen at Fairfield, Me., of forming a company to build a pulp mill to use up the sawdust and shavings from the sawmills. Twenty-horse-power will turn out five tons of dry pulp daily from one machine. The mills at Fairfield have waste enough to keep a number of machines running. Several newspapers are already using paper manufactured from sawdust, the pulp having a longer fiber, which adds to its strength. The paper is white and smooth, and much stronger than the common wood pulp newspaper.—*Industrial Journal.*

The Brady Manufacturing Company (James Brady Treasurer and Manager), Brooklyn, N. Y., have issued a circular announcing the purchase of the business and good will of James Brady, whose machine shop at 257 Water Street was burned last fall. The company has a new shop near the entrance to the big bridge, and with new tools and fixtures of the latest and most approved design, they are ready to do anything and everything usually done in a first-class machine shop. They will furnish complete plants for the manufacture of articles requiring interchangeability of parts, and send competent men to give instructions when required. Mr. Brady has had a long and successful experience in this line. The other officers of the company are Wm. L. Breyfogle, President, and E. O. Williams, Secretary.

Machinists' Supplies and Iron.

NEW YORK, January 15, 1885.

There has been no change in the condition of the supply trade worthy of mention since last week's report was made. There is rather a hopeful feeling among dealers, but it does not arise from any increased activity in business. Prices are as low as ever, and show little sign of improvement. Steam supplies and boiler material are much in the same condition as machinist supplies.

Iron—No improvement could be looked for in the condition of the iron trade during the first half of this month, for it is always a dull part of the season, and this year has been no exception to the past rule. Although the demand for pig is likely to be light for some time, furnacemen show no disposition to accept lower prices. So far as reported, prices hold steady. Standard Lehigh and North River brands are quoted at $18 to $18.50 for No. 1 X Foundry; $17 to $17.50 for No. 2 X Foundry at tidewater, and Grey Forge, $14.50 to $15.50.

Scotch Pig—This market continues dull and prices nominal, with the demand very light. We quote Shotts $21.50 to $21.75, to arrive; Coltness, $21.50 to $21.75, to arrive; Glengarnock, $19.50, to arrive; Gartsherrie, $20.50; Summerlee, $20.50; Cambroe, $19, to arrive; Eglinton, $18.50; Langloan, $21; Dalmellington, $19.

Antimony—Regulus has been in moderate demand at 10¼ cents for Hallett's and 10½ cents for Cookson's.

Copper—This market has ruled firmer than it has done any week since the combination broke. Dealers have been asking 11⅛ cents for Lake, but sales have been made at 11¼. Baltimore and other outside brands are quoted at 10½ to 10¾ cents.

Lead—This market has ruled quiet but firm, and prices have an upward tendency. Common pig is quoted at 3.80 cents.

Tin—The demand has been light, but the market is slightly firmer than it was last week. For jobbing lots Banca is quoted at 19c.; Straits and Malacca, 16.50 to 16.60c.

✲WANTED✲

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Wanted—Position as draftsman or superintendent, by an ingenious and reliable practical mechanic. A. B., 279 4th Av. N. Y.

Wanted—A foreman to take charge of an iron foundry in locomotive work. Address L. W., AM. MACHINIST, with reference, age, experience, and where last employed.

First-class patternmaker wants position as foreman. 18 years experience—8 as foreman. Thoroughly understands foundry work and drawing; Highest references. Address "Energy," care AM. MACHINIST.

Wanted—Position as manager, superintendent or designer, by Mechanical Engineer who has had a technical education and ten years' practical experience in mechanical work and the above positions. Best references. Ad Box 15, AM. MACHINIST.

For Sale—Our Worthington duplex steam pump, nearly new, in perfect order, size 4½ x 2¾ x 4. Will be sold low if applied for soon. Address Wm. H. Clapp, Weymouth, Mass.

A well-appointed foundry, in complete working order, on tidewater in Brooklyn. Lease for ten years, or less, with immediate possession, will be given. Rent, to desirable tenant, low. Address P. O. Box 2619, New York City.

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The Waters Perfect Governor.
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For Hard Coal or Coke. Indispensable in all shops to keep **Bradley's Cushioned Hammers** and men fully employed and reduces cost of production.
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A NEW MOVEMENT! SEND FOR DESCRIPTION.
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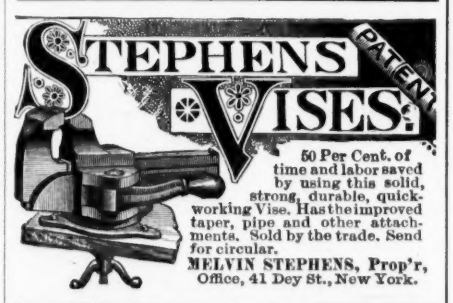

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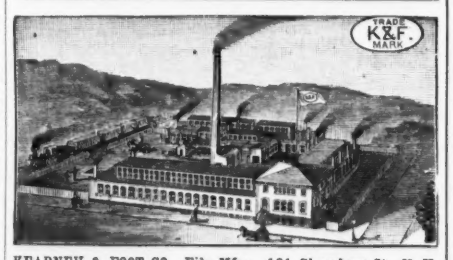

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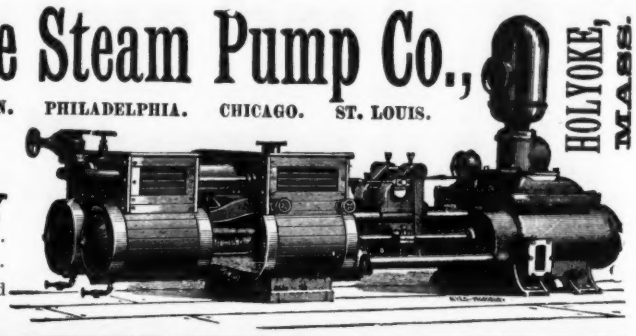

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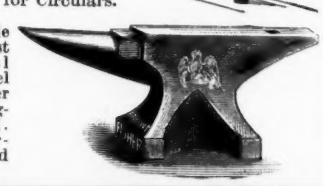

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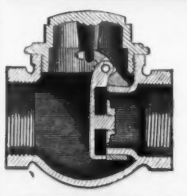

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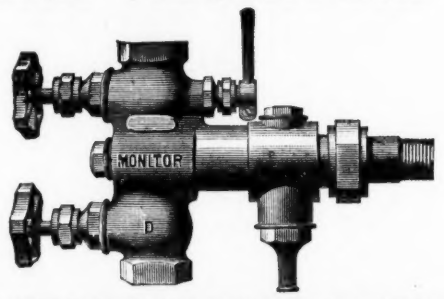

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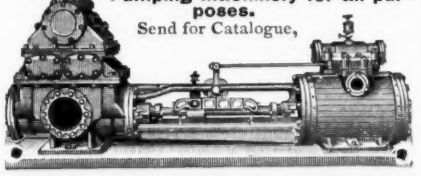

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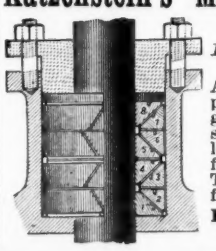

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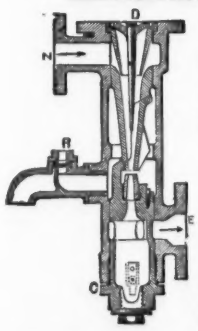

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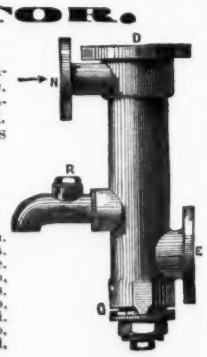

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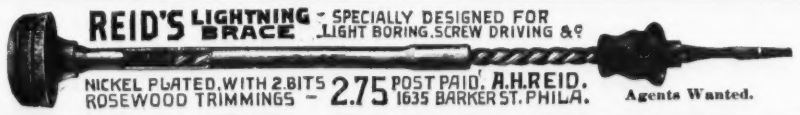

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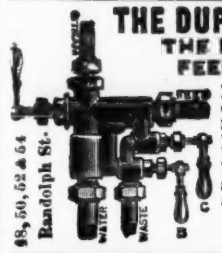

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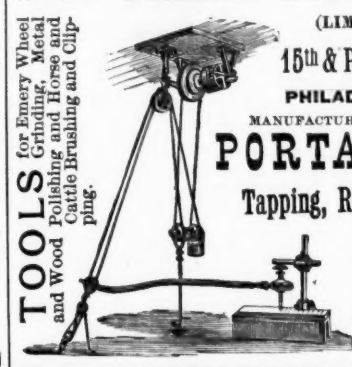

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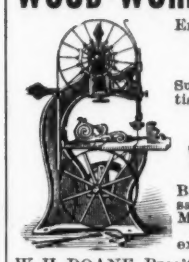

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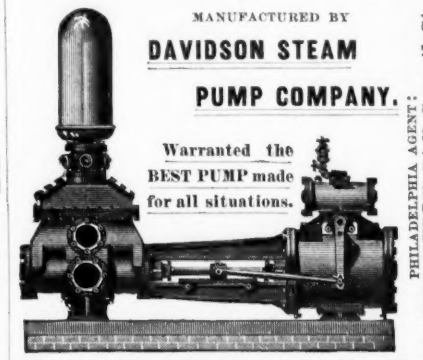

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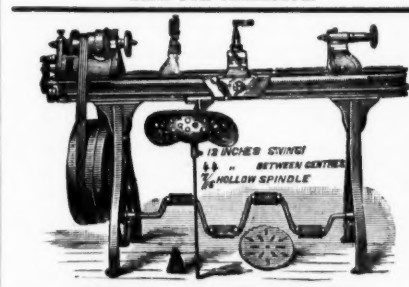

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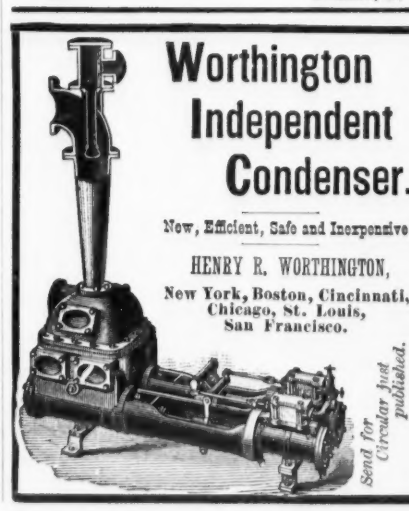

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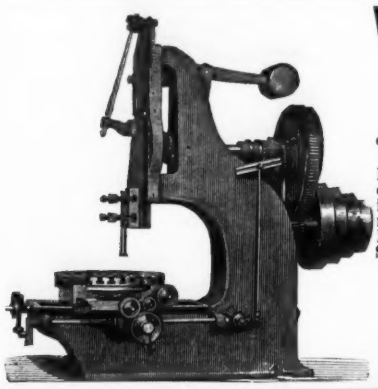

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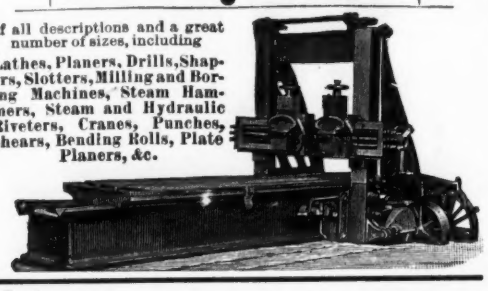

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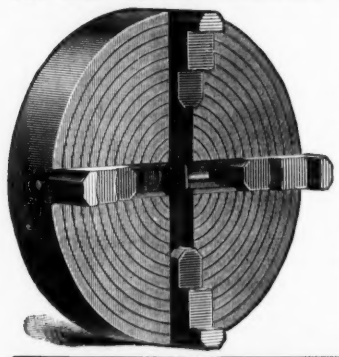

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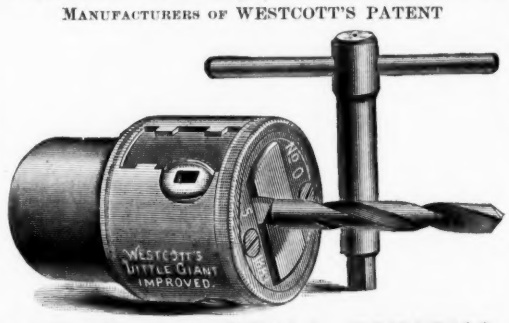

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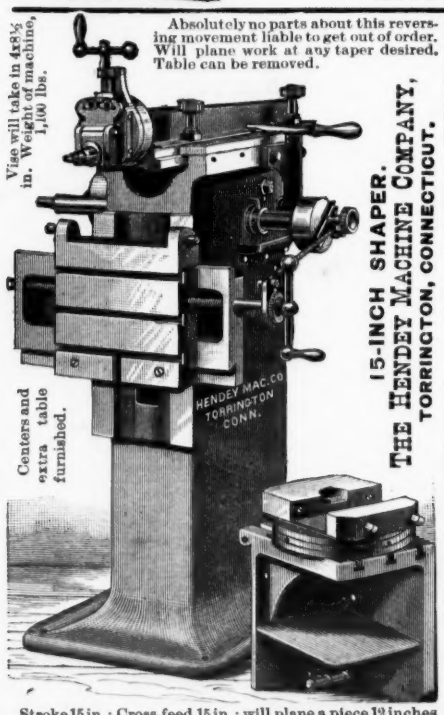

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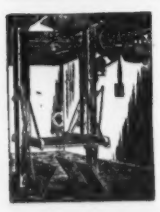

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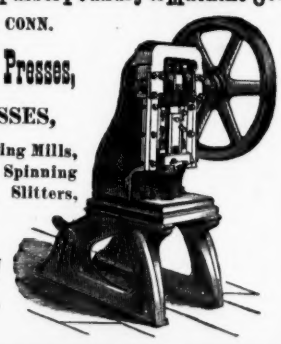

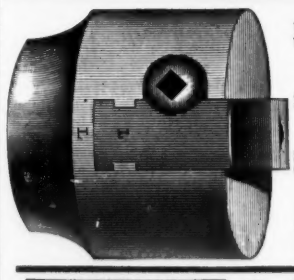

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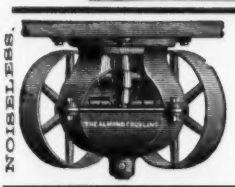

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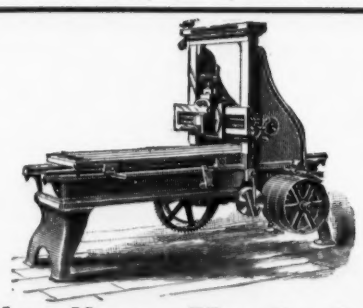

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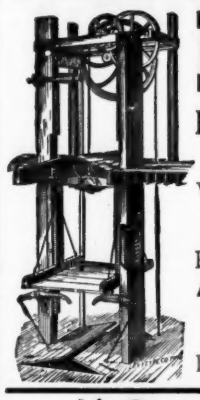

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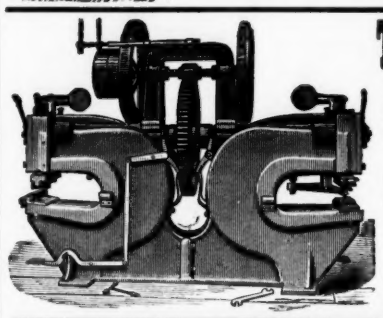

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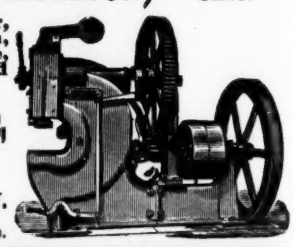

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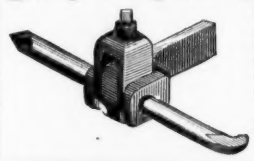

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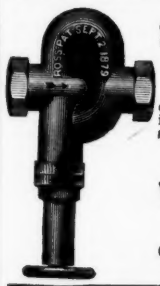

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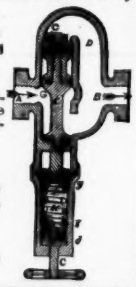

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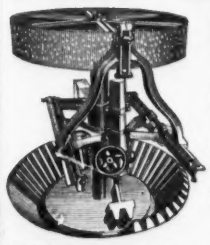

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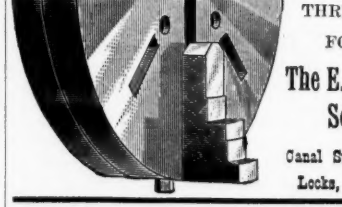

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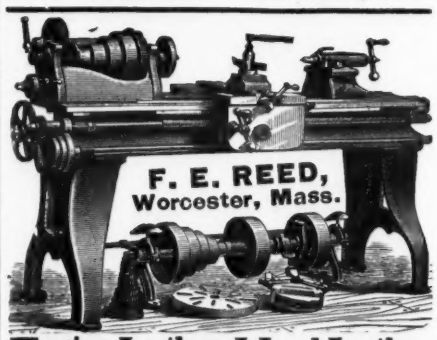

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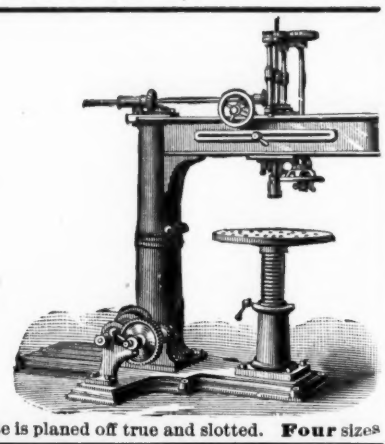

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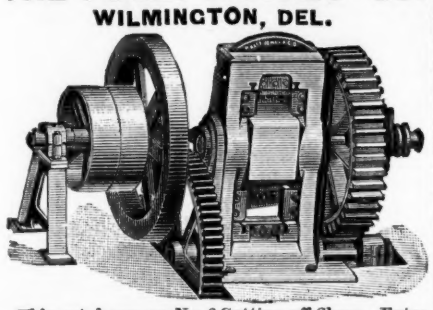

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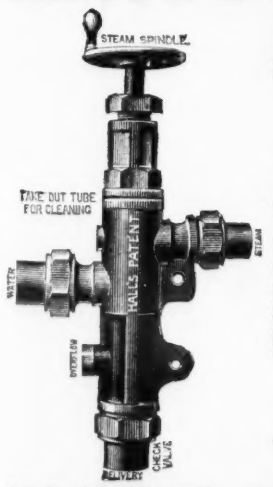

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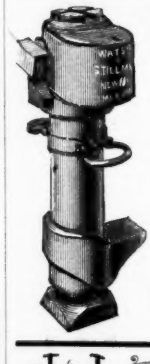

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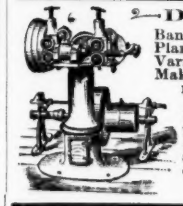

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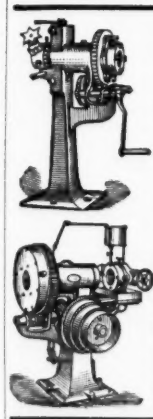

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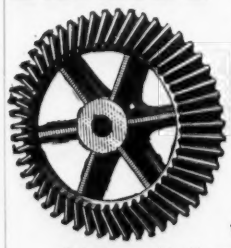

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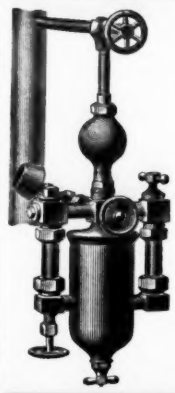

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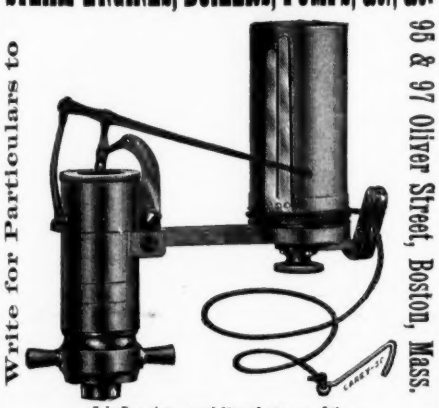

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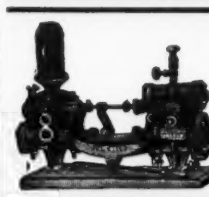

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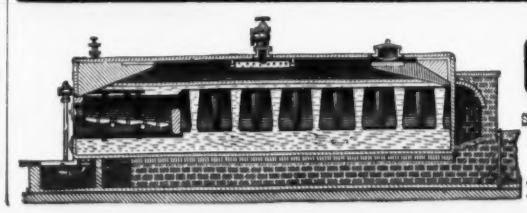

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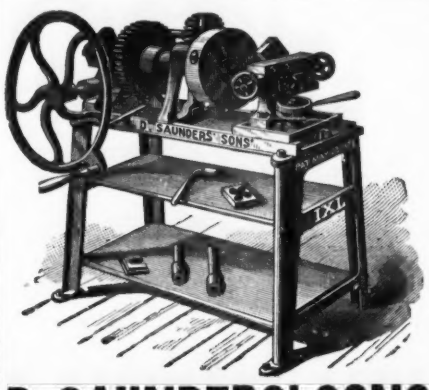

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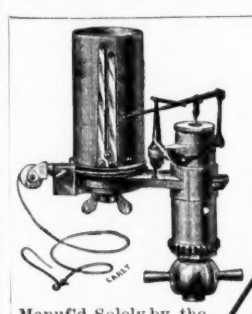

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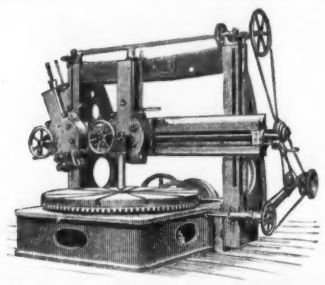

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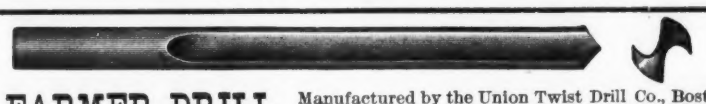

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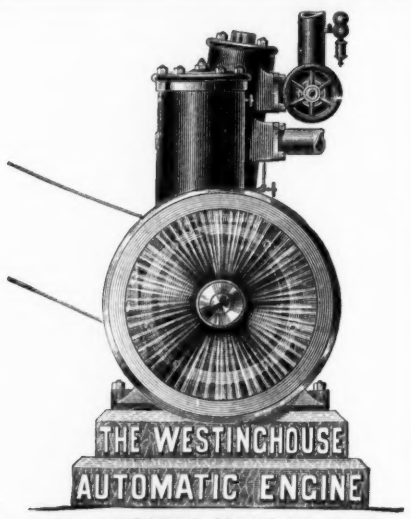

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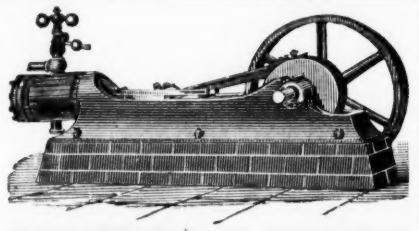

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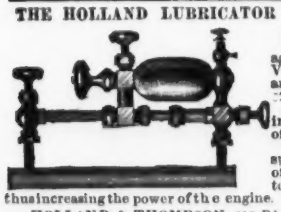

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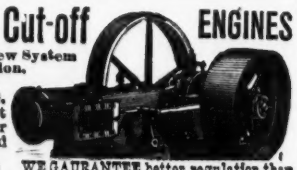

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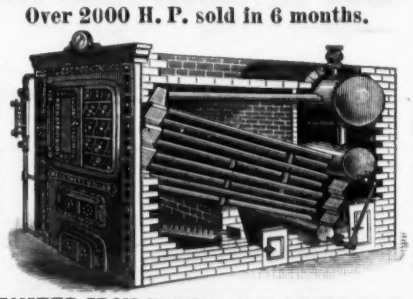

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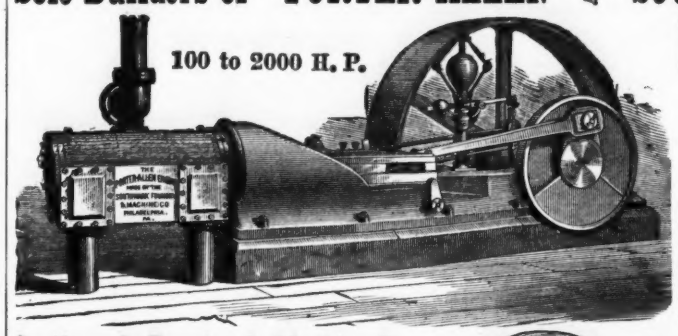

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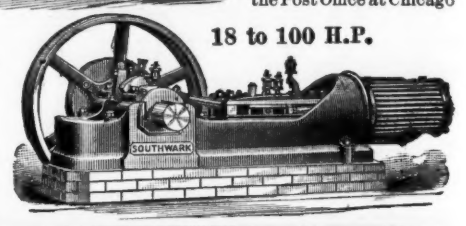

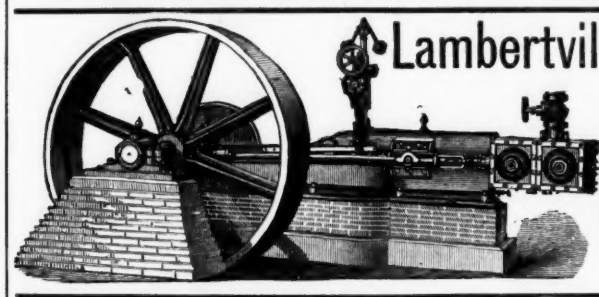

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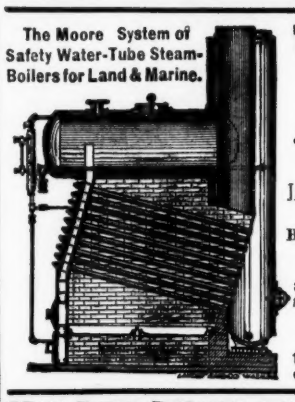

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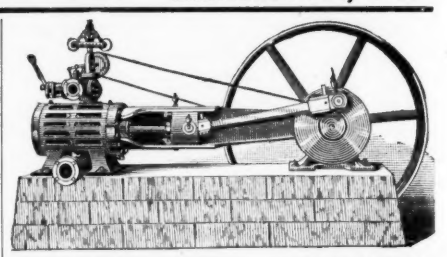

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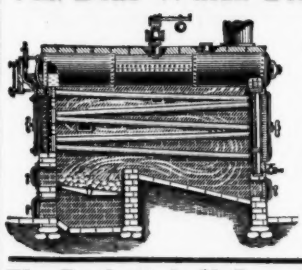

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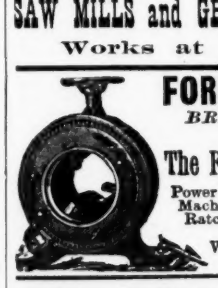

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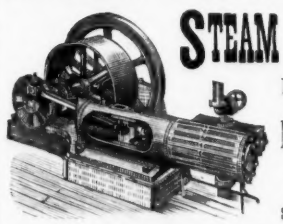

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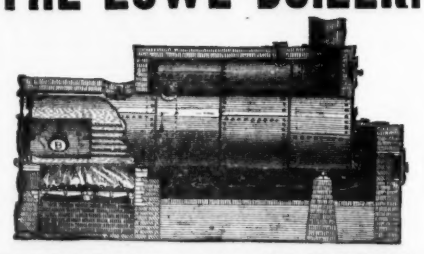

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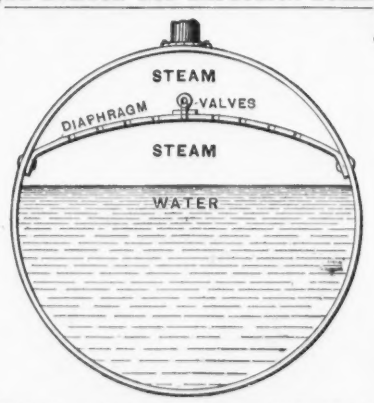

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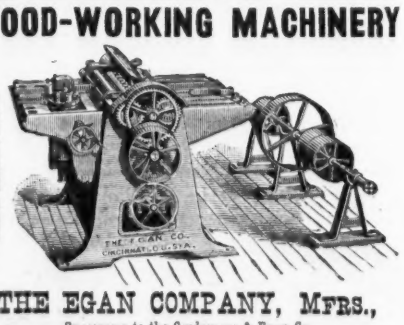

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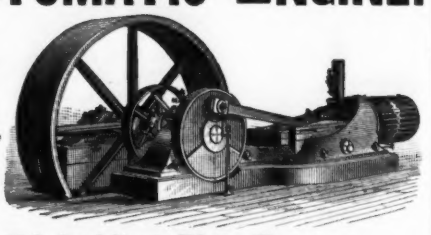

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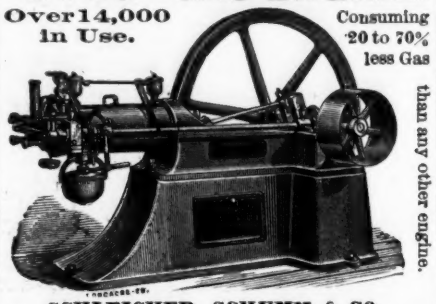

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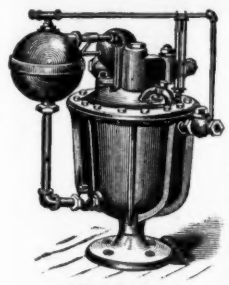

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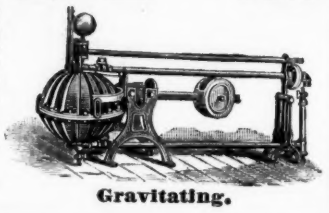

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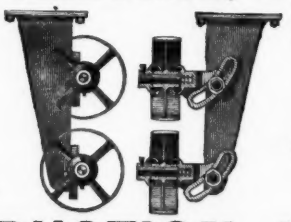

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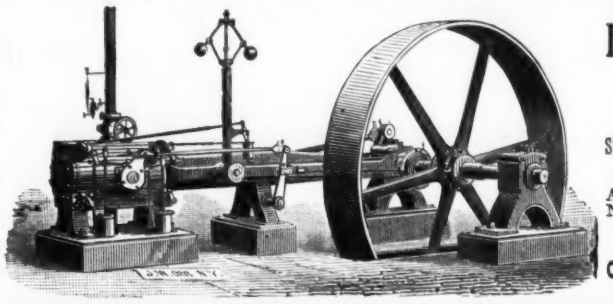

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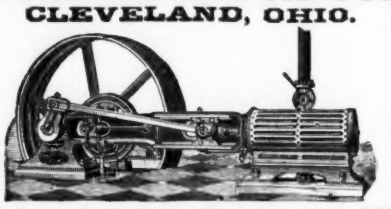

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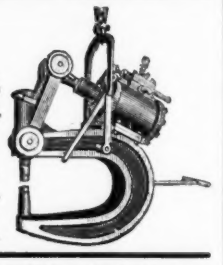

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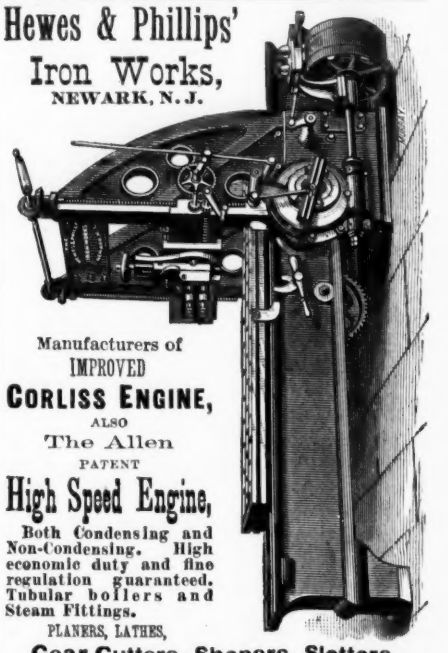

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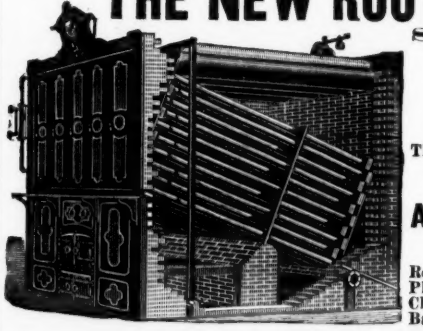

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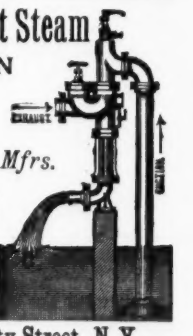

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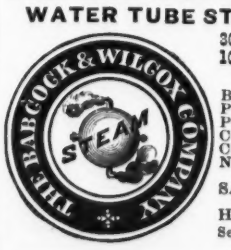

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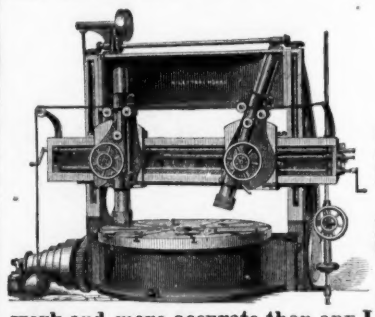

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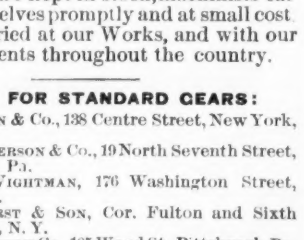

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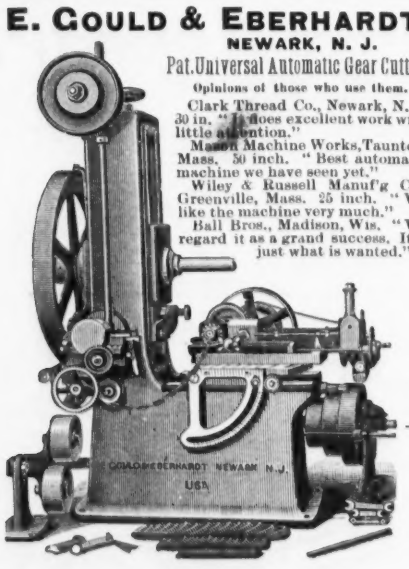

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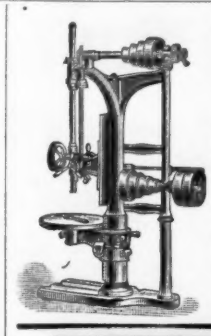

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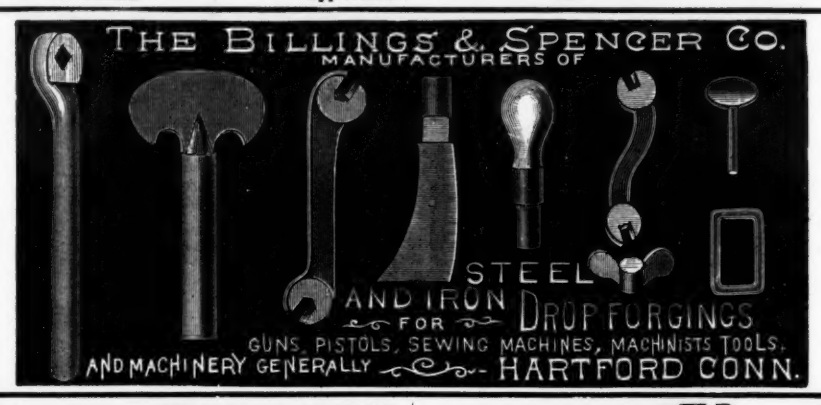

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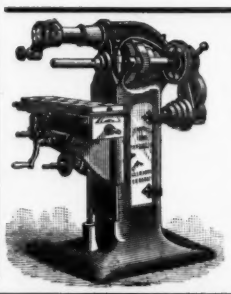

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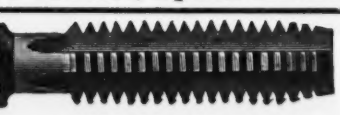

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